

**PROFILE OF DIABETIC COMPLICATIONS AMONGST DIABETICS
ATTENDING INTERNAL MEDICINE OUTPATIENT DEPARTMENT AND
FAMILY MEDICINE OUTPATIENT DEPARTMENT IN DORA NGINZA
HOSPITAL PE HOSPITAL COMPLEX**

BY

Dr Emmanuel Enuagwuna Ajudua

M.B.B.S (N.A.U. Nigeria)

**A research project submitted in partial fulfilment of the requirements for the
degree Masters in Family Medicine. M.Med Fam Med.**

In the Faculty of Health Sciences

Division of Family Medicine/Primary Care

Stellenbosch University



August 2009

Supervisors: 1. Professor PJT de Villiers (internal)

2. Dr D.O. Okere (external)

Biostatistician: Professor M. Kidd

<u>TABLE OF CONTENTS</u>	<u>Page</u>
Acknowledgements	4
Abstract	5
Introduction	7
Literature Review	10
Aims and Objectives	12
Methodology	13
Sample size	14
Measurement	14
Pilot Study	16
Statistical method	16
Ethical Considerations.	17
Analysis of Data/Results	18
Discussion of Results	51
Bias	56
Conclusion	57
Recommendations	58
References	60
Addendum 1	64
Addendum 2	65

ACKNOWLEDGEMENTS

The journey of a thousand miles begins with one step. When in 2005 I suggested to my wife that while we await residency posts myself in Obstetrics and Gynaecology and she in Paediatrics we should pursue a degree in Family Medicine, little did we know that 4 years will come and pass so quickly. Little also did we know that we were both going to develop so much passion for a discipline that was supposed to make us pass time. 4 years is a long period. Along the way a lot of people came to my aid spiritually, morally and materially. A few are worthy of mention. I would like to thank my lovely wife for her encouragements especially when I was almost reneging and giving up in a defeatist manner. Thanks also go to our 3 lovely children Henry, Emmanuella and Ruth. I thank you for your patience throughout these 4 years.

To Prof PJT de Villiers whom I consider the Father of Family Medicine, I am honoured to have you as my supervisor. Your contribution to this project is immensely appreciated. I will always remain indebted to you.

To Dr D.O. Okere, your family will continue to be an inspiration to those of us still growing. Your ethical approach to issues irrespective of racial inclination and fraternity makes you stand out as a gift to this noble profession soon to be realized at a bigger stage in the medical parlance.

To Prof Kidd, the biostatistician, your ingenuity and speedy response to my questions and worries is amazing. The assistance you rendered is invaluable. Thank you and please keep the flag flying.

My appreciation goes to Dr. F. Rank, the clinical governance manager. In 2006, sequel to my communicating with Dr. F. Rank regarding my requirements in training, he agreed to embrace the recent pedestal God has placed Family medicine in South Africa despite the unnecessary politics and politicking we continue to encounter in

our resolve to develop an excellent Family Medicine department in the PE Hospital Complex.

To Dr Vehbi, Superintendent Dora Nginza Hospital, thank you for trusting me. You believed so much in me, so much so that you appointed me coordinator of the academic programme in Family Medicine while still in my third year of training. Thank you for allowing me conduct this study in Dora Nginza Hospital. I want to pledge my support for the Family Medicine department wherever I may be in future. Family Medicine, Dora Nginza has become a passion for me.

My sincere appreciation also goes to Dr B. G. Brown, Head of the PEHC Ethics Committee for timeously approving my research proposal.

To Dr E. Udojie, thank you for your suggestions and advice with the manuscript.

I want to thank the entire staff at the records department for their indefatigable search and collection of patients' folders in readiness for my collection. Finally, my appreciation goes to the Professional nurses at H and L block for their compilation of the names of diabetic patients in each of their clinics. I realized the intense nature of the work I had given you when I had to verify these names myself. I would especially like to thank Sr. Ntshona in this regard. May God bless you abundantly. May God bless all of you abundantly. Thank you.

ABSTRACT

Introduction: Diabetes is the most prevalent endocrinology problem encountered in primary care practice. If recent trends showing a dramatic increase in prevalence (believed to be a consequence of a decline in physical activity and excessive caloric intake) continue, then the condition will soon affect nearly 20 million people in the

U.S a reflection of the global trend. Effective management requires care that is thoughtful and meticulous, incorporating intensive patient education. Euglycemic control, with the level of glycosylated haemoglobin (HbA1c) kept below 7.0mmol/L, has emerged as a major treatment objective because of its association with a marked reduction in the risk for micro vascular complications. The primary physician is in the unique position to provide comprehensive care to the diabetic patient. **Setting:** The aim of this study is to evaluate the profile of complications arising due to diabetes mellitus among adult diabetics attending internal medicine outpatient department and family medicine/primary care outpatient department in the Dora Nginza hospital, PE hospital complex. **Method:** The study is a descriptive retrospective study in which names of patients were collated from clinic records of both clinics, files sought at the records department covering the period between Jan 2007 and Jan 2008 inclusive. Prevalence of statistical variables was generated using frequency tables, bar graphs, cross tabulations and chi square test. **Results:** Hyperglycemia was the major complication which predominantly was associated with high haemoglobin A1c (HbA1c) levels. However, some hyperglycaemic cases were also found to be associated with normal HbA1c. Complications were found to be more in type 2 diabetics. Patients with hypertension, obesity, smoking and alcohol use were observed to have a higher risk of developing diabetic complications. The findings on retinopathy in this study was inconclusive in view of the fact that patients sent for fundoscopy did not return with documented results from the sister hospital PE provincial hospital. Family Medicine outpatient department overall did better in patient care compared to the Internal Medicine outpatient department. **Conclusion:** The challenge for the primary care physician is to design a therapeutic program that is safe practical and acceptable to the patient. The ultimate goal of therapy is the

prevention of micro vascular and macro vascular complications, consequence of diabetes that makes the condition a major risk factor for cardiovascular disease, stroke, visual impairment, renal failure, impotence, peripheral neuropathy, limb loss and ultimately death. These can be averted through appropriate education of both hospital staff, patients and their care givers. The recommendations made are based on the findings of the study.

INTRODUCTION.

The researcher works in the Family Medicine Department of Dora Nginza Hospital. Dora Nginza Hospital is a part of the PE Hospital complex, comprising of Livingstone Hospital, Dora Nginza Hospital and the PE Provincial Hospital. Dora Nginza Hospital is located in Zwide on the outskirts of Port Elizabeth along the R75 route to Uitenhage. It offers a combination of tertiary, level 2 and level 1 service. The hospital has 570 beds and serves a population of about 650,000 to 800, 000 people. It drains patients from the Motherwell, Kwazakhele, Zwide, Kwamagxaki, Kwadwesi, Swartkops townships, and other areas outside of PE. With the rationalization of services in the PE Hospital complex, Dora Nginza Hospital services include Maternal and Child health (O&G and Paediatrics), Internal Medicine, Family Medicine and Primary care, Adult and Paediatric Wellness unit, a Psychiatry department and a 24 hour Casualty service.

The Medical outpatient department sees a total of 50 patients daily at least 20 of these are diabetics. The Primary Health care out patient unit sees a total of 120 patients daily of which about 50 are diabetics i.e. both newly diagnosed and well established Diabetes mellitus.

The basic mechanism of pathology in diabetes mellitus is an absolute or relative deficiency of insulin affecting the metabolism of carbohydrates, protein and fats resulting in further disturbances of electrolyte homeostasis. Death may occur as a result of acute metabolic derangement, or chronic metabolic disturbances which cause structural damage to organs of the body. The structural changes are described as complications of diabetes mellitus which affect various organs of the body and are classified into macrovascular (hypertension, stroke, coronary artery disease) and microvascular (retinopathy, nephropathy, peripheral vascular disease) complications. Diabetes is a global health problem and its incidence is rising with increase in developing nations adopting a more developed world lifestyle. It still remains though, that the prevalence in different parts of the globe is still affected by the various genetic and environmental conditions that prevail in these areas. The World Health Organisation (WHO) estimated that in 1998, there were 135 million people with diabetes globally. The estimate rose to 171 million people in 2000 and has been projected to increase to 366 million in 2030. Much of the increase projected will occur in developing countries arising from growth of their populations as well as urbanisation associated with increasing trends towards unhealthy diets, obesity sedentary lifestyles resulting in late onset diabetes. According to literature, 3.5% of the South African population is diabetic but almost 50% of type 2 diabetics remain undiagnosed. The more common form of diabetes world wide is believed to be Type 2 diabetes and in the United States and Europe it is a ratio of 7:3. The International Diabetes Federation in 2003 put estimates of prevalence of diabetes in Sub Saharan Africa at over 7 million of the 295 million population i.e. 2.4%. It is also shown in literature that there is a significant association between hypertension, macro/micro vascular as well as neuropathic and renal complications among patients with diabetes

mellitus^{1,2,3}.

At Dora Nginza outpatient units it has been noted that there is an appreciable number of patients with diabetic complications. Often these complications are not picked up early enough to allow for stricter control measures to be put in place for these patients. The result is that there is high morbidity and mortality associated with the illness at these clinics. More often than not when the complications are noted there is no clear plan for further management of these patients and even when a doctor draws a protocol for an individual it is disregarded by other physicians. The researcher is of the opinion that in order for the management of these patients to have a better outcome, there must be practical approaches set out as to further management and future plans for the patients with these problems. This largely informed the researcher's choice of the research topic. It is not aimed at describing the high prevalence of complications which is known to all but rather the result of this study will serve in setting out protocols for the patients' management and designing appropriate intervention based on the services available in the Port Elizabeth Hospital Complex. The study will also aid in future plans for rationalization of services that could aid in the management of patient complications. Essentially the result of this study and the audit that is to follow will aim to show the problems with patients and aid in drawing up a formal protocol for management of the patients in the clinics. No formal statistics regarding the prevalence of diabetic complication is available in Dora Nginza hospital, which further elucidates the need for research in this field. It will help in organizing the resources available to the good use of these patients.

Literature Review.

It has been described in studies⁴ that diabetic complications are present in an appreciable percentage of diabetics 10 years after onset regardless of age or sex. This was shown after a study assessed albumin excretion rate, plasma creatinine, lipid profile, glycosylated haemoglobin (HbA1c), blood pressure, presence of retinopathy, clinical polyneuropathy and diabetic control. A significant association was described between micro vascular complications, elevated HbA1c and hypertension^{4,5,6}.

Lowering HbA1c in type 2 diabetics decreases the risk of developing coronary heart disease⁷ and Fritsche et al⁸ concluded that effective therapy must be instituted early to avoid the development of complications. Diabetics of African origins in the United States were noted to have poorer glycemic control than their white counterparts, also noted was the fact that they are predisposed to having higher systolic blood pressures and their poorer risk profile tended to increase their chances of developing proliferative diabetic retinopathy. Ning Cheung et al¹, described diabetic retinopathy associated with a 2 fold higher risk of coronary heart disease and a 3 fold higher risk of fatal coronary heart disease events.. Boelter et al⁹, in a cross sectional study of 1214 patients described that type 2 diabetic patients with proliferative diabetic retinopathy presented more often with renal involvement evidenced by urinary albumin excretion within the microalbuminuria range. They suggested that all patients with proliferative diabetic retinopathy should undergo evaluation of renal function including urinary albumin measurements.

A slightly raised BMI is of lesser prevalence in type 2 diabetes than in the general population and cardiovascular risk was not worse if there was good glycemic control.¹⁰ In the study of Kramer et al,¹¹ the presence of low glomerular filtration rate in normoalbuminuric patients was associated with high levels of triglycerides or the

metabolic syndrome. They say that the assessment of renal function in type 2 diabetic patients should include measurement of glomerular filtration rate especially in the presence of metabolic syndrome.

An Italian study¹² aimed to describe the interaction between clinical, socioeconomic and care related factors, noted that in type 1 diabetes mellitus, the interaction between hypertension and smoking habit increased the risk of complications; on the other hand poor follow up in Type 2 diabetes mellitus was associated with more risks. It is important to note factors like the patient's level of education, socioeconomic status and other variables. In the study of Bakris et al,¹³ systolic hypertension is said to be a strong predictor of renal outcomes in patients with nephropathy resulting from type 2 diabetes mellitus with the highest risk for nephropathy progression. They however said that risk reduction occurred with lowering the systolic blood pressure to levels lower than 140mmHg. Other studies¹⁴ have confirmed the link between hypertension and other macro vascular complications in diabetic patients. One such study confirmed that tight blood pressure control significantly reduces the cost of complications and increases the interval without complications in type 2 diabetics¹⁵. An epidemiological study in Germany¹⁶ profiled factors associated with diabetic nephropathy listing them as long duration of diabetes mellitus, poor control of HbA1c, dyslipidemia, hypertension and the male sex. It recommended that for prevention of diabetic nephropathy patients must be treated promptly for dyslipidemia and hypertension.

Autonomic symptoms (orthostatic intolerance, secretomotor, urinary control, diarrhoea, sleep disturbance, pupillomotor, vasomotor, erectile dysfunction) and sensory deficits of diabetes mellitus are common but mild in severity and this

correlates poorly with type of diabetes mellitus. Deficits over all are weak in diabetic neuropathy, which emphasizes the need to evaluate autonomic symptoms separately.¹⁷

Another complication often described among diabetics on insulin is hypoglycemia which could be asymptomatic in a number of patients. Patients on insulin for more than one year are predisposed to hypoglycemic complications¹⁸ often said to be as a result of alterations in insulin absorption which result from the development of antibodies to the porcine insulin (commonest form of insulin). The development of these antibodies slows the absorption of the insulin.

A population based study of primary care¹⁹ recommends the use of annual foot examination in identifying high risk foot conditions like peripheral vascular insufficiency, loss of protective sensation so that specific interventions can be used to reduce the chances of amputation. Another study²⁰ revealed that atrophy of foot muscles is closely associated with the severity of neuropathy and reflects motor dysfunction.

Stephan et al²¹ in their study highlighted the importance of exercise as a cornerstone in management of type 2 diabetes. Lifestyle changes are more effective in the long term in patients with type 2 diabetes²². Inherently, it is important to involve rural physicians in the management of diabetics and to develop community based diabetes control.

AIM

- To describe the profile of diabetic complications in adults at the medical outpatient and primary health care unit of Dora Nginza Hospital, Port Elizabeth.

OBJECTIVES

- To Identify records of patients with diabetes mellitus attending the medical out patient and primary health care unit at the facility
- To compare diabetic care, complications and other variables at these clinics.
- To record the type of diabetes and complications related to diabetes in this group
- To record identified co morbidities (e.g. hypertension, hypercholesterolemia, etc.) in this group.
- To study the association of diabetic complications with social habits, glycemic control and duration of diabetes mellitus.
- To make recommendations to the hospital management board based on the findings of the study, to aid in the improved care of diabetic complications and co morbidities.

METHODOLOGY

A retrospective descriptive study design was used.

The names of all patients with diabetes were extracted from the clinic's records. The patients' files were obtained from the records department and the diabetic complications and other information required for the study were collated from the patients' files e.g. co morbidities, social history i.e. smoking, alcohol consumption and dietary habits.

POPULATION.

The population studied were all patients with diabetes mellitus who presented to the clinics between January 2007 and January 2008 inclusive, with age ranging from 18 years and older.

SAMPLE SIZE.

The sample selected from the total population of 2395 was 300. Study participants were randomly selected from all patients who presented in the year under study i.e. January 2007 – January 2008. This form of sampling was chosen to achieve a sample population that is representative of the patients seen at the clinic in the year of study. A total of 150 patients were randomly selected from the medical outpatient clinic (L block) with 1190 patients and 150 from the primary health care out patient clinic (H block) with 1205. Each clinic had a sample size of approximately 12% chosen from the study population seen over the period under study.

Method of Data collection / Measurement.

An excel sheet was generated with the following clinical data as headings for columns and each patient was represented with a code at the beginning of the rows.

The following data were extracted from the participant's records :- Sex, age, weight, height, blood pressure reading, type of diabetes, random hemoglucotest (each patient had more than one reading for the period of study, the assessment was based on whether any of these readings was above or below the normal range for random hemoglucotest), HbA1c, lipid profile (where recorded), record of dietary advice being given, electrolytes (Na, K, Cl), Urea, Creatinine, record of presence or absence of

neuropathy, record of presence or absence of retinopathy, record of presence or not of infections, record of comorbidities i.e. any other chronic medical illness, record of DKA(diabetic ketoacidosis), record of HONK (hyperosmolar non ketotic coma),.

Selection Criteria

The criteria used for defining the conditions described in the study are as follow:

- Fasting glucose - 4.0 – 7 mmol/L
- Random glucose - 7 - 10mmol/L
- Sodium (Na) 135 - 147mmol/L
- Potassium (K) 3.3 - 5.3mmol/L
- Chloride (Cl) 99 - 113mmol/L
- White cell count (WCC) range – $4 - 10 \times 10^9$

Renal impairment assessed as

- Urea - > 6.6 mmol/L
- Creatinine – >120mmol/L
- Neuropathy – Patient’s notes give history of numbness in the extremities, pins and needle sensation in the extremities, erectile dysfunction, features of autonomic dysfunction like gastroparesis
- Elevated total cholesterol > 5.0mmol
- Hypertriglyceridemia > 1.5mmol/L
- Elevated LDL (low density lipoprotein) > 3.0mmol/L
- Optimal HDL (high density lipoproteinemia) > 1.2mmol/L
- Co morbidities – patients with any other chronic medical conditions other than diabetes mellitus (based on reported findings in patient’s clinical notes)

- Social habits – only patients who had habits such as cigarette smoking, and alcohol use were considered in this study.
- Systolic hypertension > 130mmHg
- Diastolic hypertension > 80mmHg
- Normal Hemoglobin (Hb) levels Men - 13 - 17g/dL; Women 12 - 15g/dL; any Hb level less than the lower limit for the gender was considered as anemia.
- Retinopathy- Patients who returned from PEPH with abnormal findings after fundoscopy e.g. hard exudates, cotton wool spots, soft exudates, flame haemorrhages etc.
- Proteinuria - Urine dipstix showing persistent proteinuria 1+ and above

Pilot Study

A pilot study was done to avoid unexpected problems and difficulties with the data collection process. The nurses were involved in the pilot and random selection of the files. As already noted patient's data were randomly collected prospectively in the pilot study (retrospectively in this study) as they were seen in the clinics over a period of 2 months. Information gathered from the files was written on excel sheet by extraction schedule structural technique.

Statistical Method used in data analysis:

Prevalence of statistical variable was generated using frequency tables and visually displayed in tables and bar graphs. Comparisons of different groups were done using

cross tabulation and the Chi square test. Frequencies, percentages and cumulative frequencies were calculated for categorical data. Median was also calculated of the different category of variables. These are presented in a tabular form, and histograms. In quantitative analysis, the search is for patterns between variables using techniques such as two and three variables' tables to achieve good analysis. In quantitative research there are cases and for each case some data. In this study variables were first identified through data analysis. The analysis consists of looking at all the transcripts. What then followed was to generate hypothesis from the variables and proceeded to testing other cases to see if a similar pattern emerged elsewhere. This stage is actually equivalent to exploring the relationship between two variables in a table. In similar way of adding other variables, I proceeded to looking for other patterns of relationships between the various patterns. The end result is a statement which captured the relationships that are hidden in the data.

Ethical Considerations.

Permission to conduct the study was obtained from the Ethics committees of Stellenbosch University (Addendum 1) and the Port Elizabeth Hospital complex (Addendum 2). Permission was also obtained to conduct the study from the superintendent of Dora Nginza Hospital, Dr Vehbi, and the respective Heads of department for Family Medicine (Dr D. O. Okere) and Internal Medicine (Dr T Ellis). The ethical considerations of this study include the following:

Informed consent:

Ideally informed consent should generally be obtained from every patient for the use of personal medical data for epidemiological research. However, since this is a retrospective study, involving data extraction from patients' files, a waiver of

informed consent was sought from the ethics committee.

Confidentiality of Patient Information.

Every effort was made by the researcher to protect the confidentiality of information obtained from the medical records. This was done by de-identifying the collected data by a coding strategy. Any data identifiable was filed away separately from data used for analysis. Anyone who needed to view the data for the purposes of this study was required to sign a confidentiality agreement.

Freedom to draw own conclusions and publish the research findings:

The researcher exercised his freedom to draw conclusions and publish research findings that had scientific merit: No relevant findings were withheld by the researcher and no attempt was made to change or tone down the content of the report/result. The researcher's independence was maintained regardless of the outcome of research findings. The researcher however, took into account the risk of publishing any findings that may stigmatize the group/population being studied.

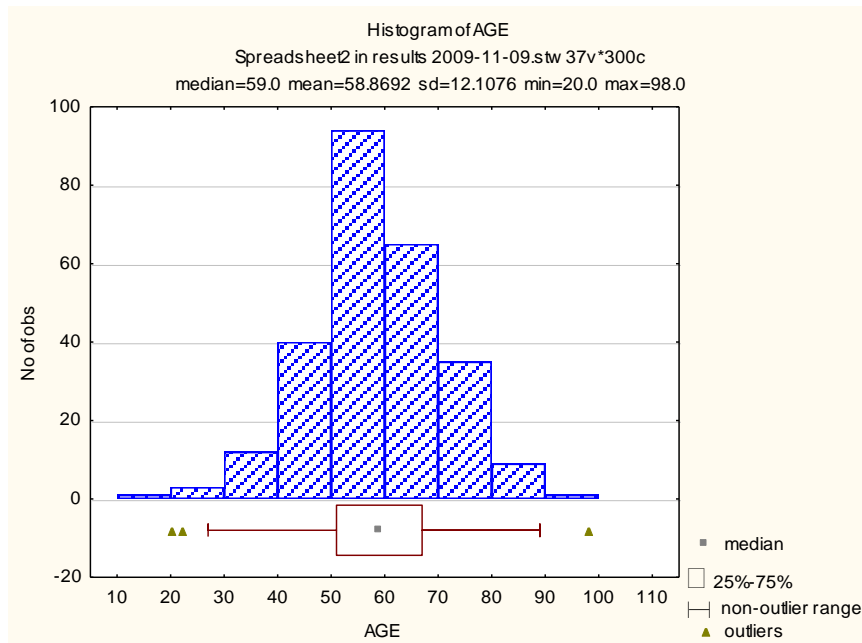
RESULTS / DATA ANALYSIS

A total of 1190 diabetics attended the L block clinic between Jan 2007 and Jan 2008. Of this 150 patients were randomly selected 131 of the patients files were found while 19 files were missing.

In H block a total of 1205 diabetics were seen between Jan 2007 and Jan 2008. Of the 150 files selected 18 files were missing. 132 files were found.

In the course of data extraction from patients' files some variables were omitted in the patients records. This altered the total number of observations for these variables and so several of the following histograms reflect total number of observations that correlate with the number of patients' who had the variables recorded in their notes.

Figure I: Age distribution of study participants, both clinics combined.



Obs=Observation. CI=Confidence interval

Only 260 patients had a record of their ages in the files. Number of observations n=260, Median is 59yrs; Mean is 58.8692yrs; standard is 12.1076; Minimum age is 20.0, Maximum age is 98; standard error 0.750879; 95% CI= 57 - 60.

Figure 2: Gender distribution of patients in both clinics

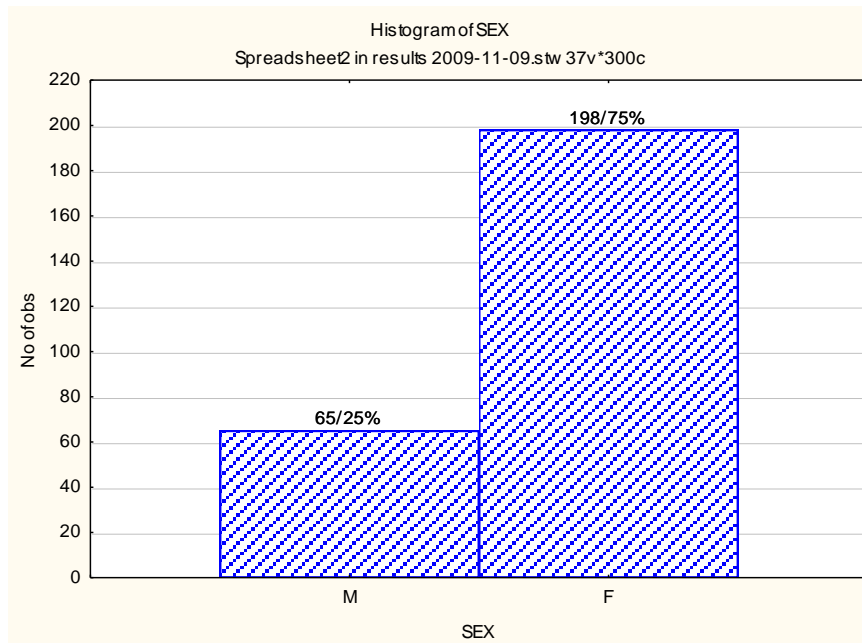


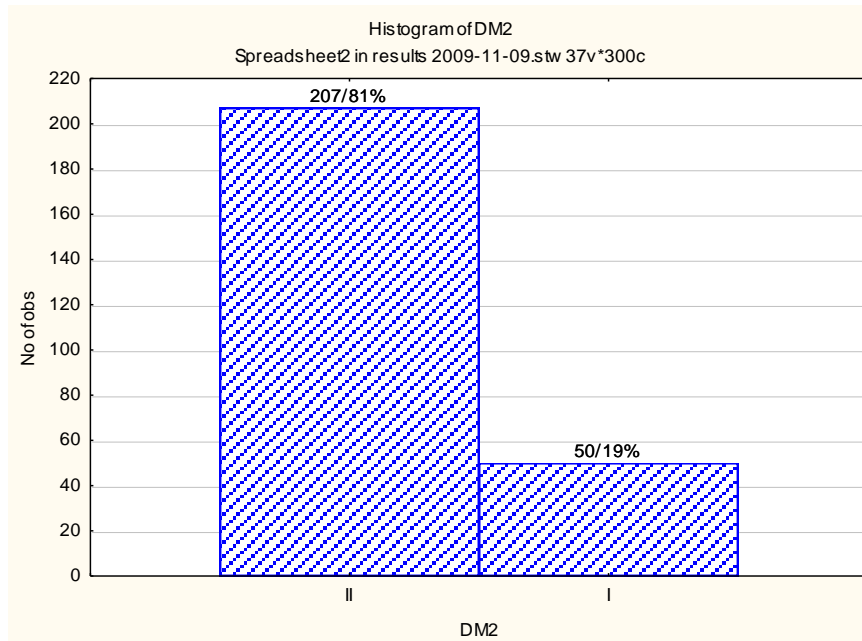
Table 1: Gender distribution of patients observed in H and L block clinics

Clinic	Marked cells have counts		
	SEX M	SEX F	Row Totals
H	25	107	132
Row %	18.94%	81.06%	
L	40	91	131
Row %	30.53%	69.47%	
Totals	65	198	263

Figure 2 and table I give a breakdown of males and females observed in both clinics.

Total observations (n) =263. H block had 25 males and 107 females with a total number of 132 patients; L block had 40 males and 91 females with a total number of 131 patients.

Figure 3: Histogram shows distribution of type 1 and 2 Diabetes mellitus

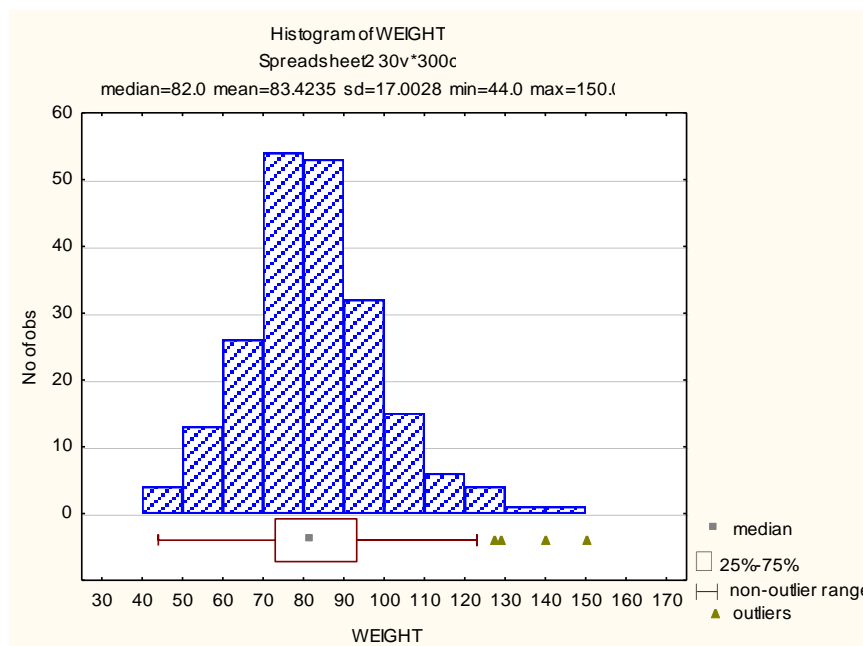


Only 257 patients had specified diagnosis of type 1 or type 2 diabetes mellitus, 81% of patients were type 2 diabetes mellitus, 19% were type 1. In the break down of male and female distribution, type 1 diabetes mellitus had 39% males to 61% females while type 2 diabetes mellitus was 19% males to 81% females.

Table II: Two way summary table of males and females grouped into type 1 and type 2 diabetes mellitus.

Marked cells have counts:			
SEX	DM2 I	DM2 II	Row Totals
M	19	45	64
Row %	29.69%	70.31%	
F	31	162	193
Row %	16.06%	83.94%	
Totals	50	207	257

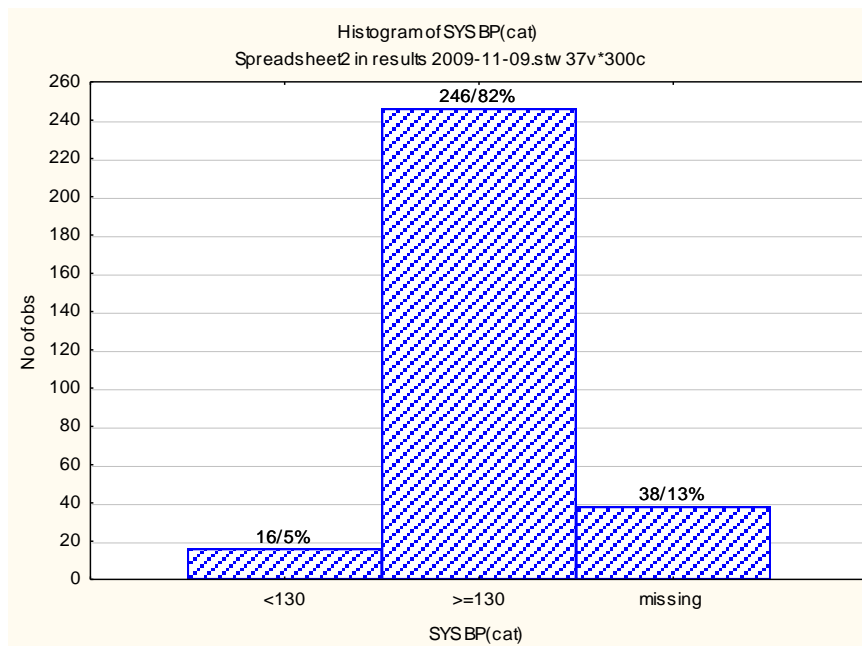
Figure 4: Weight distribution of participants.



Obs =Observation. CI=Confidence interval

The total number of patients with weights recorded were 209 in all. Number of count(n) = 209. Median=82.0, mean= 83.4235; std=17.0028; min= 44.0 max =150 Std error =1.176106; 95% CI =81 - 86. It was not possible ascertaining the BMI of all patients as only 10 patients of the entire 263 observed had a record of measured height.

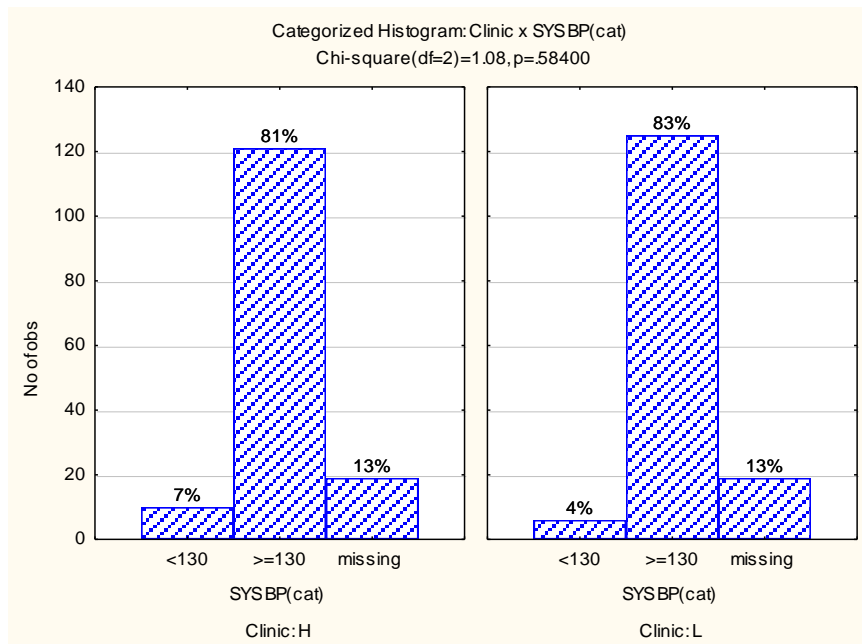
Figure 5: Systolic Blood Pressure (SYS BP) of all patients.



Obs=Observation. CI=Confidence Interval

Shows histogram for systolic BP. Number of observations (n) = 262. 38 observations were missing from both clinics and 262 of files observed for the study period had BP recordings. 246 (82%) of these patients had elevated systolic blood pressure i.e. >130mmHg.

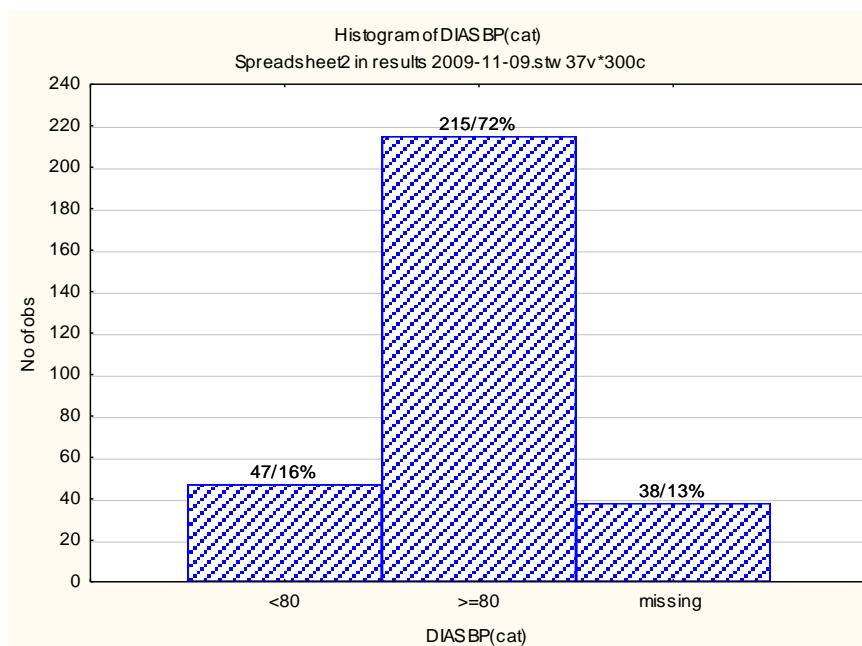
Figure 6: Categorized Histogram comparing systolic blood pressure (SYS BP) of participants in both clinics.



Obs =Observation

In comparing the 2 clinics, in Clinic H, 7% of the patients had SYS < 130; 81% had SYS BP >= 130 and 13% of the patients files were missing or SYS BP was not done. Whereas in Clinic L 4% of the patients had SYS BP < 130; 83% patients had SYS BP greater than 130 and 13% of the patient files were missing or SYS BP was not done. In both clinics more than 80% of patients had elevated systolic blood pressure.

Figure 7: Diastolic blood(DIAS BP) pressure of participants in both clinics.

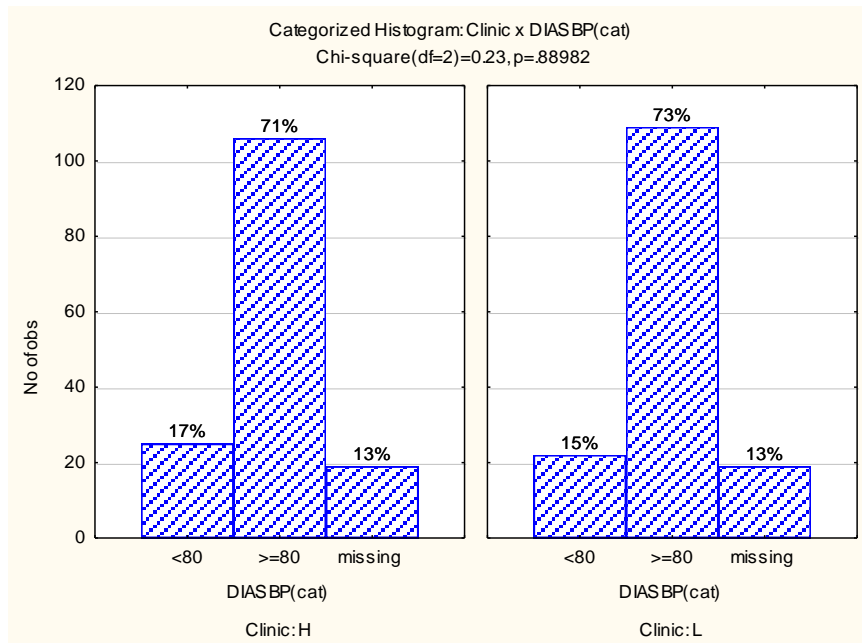


Obs=Observation.

The total number of patients with diastolic blood pressure recordings were 262..

Number of Observations (n) = 262. 38 observations were not done. 72% (215) of patients in both clinics had elevated diastolic blood pressure.

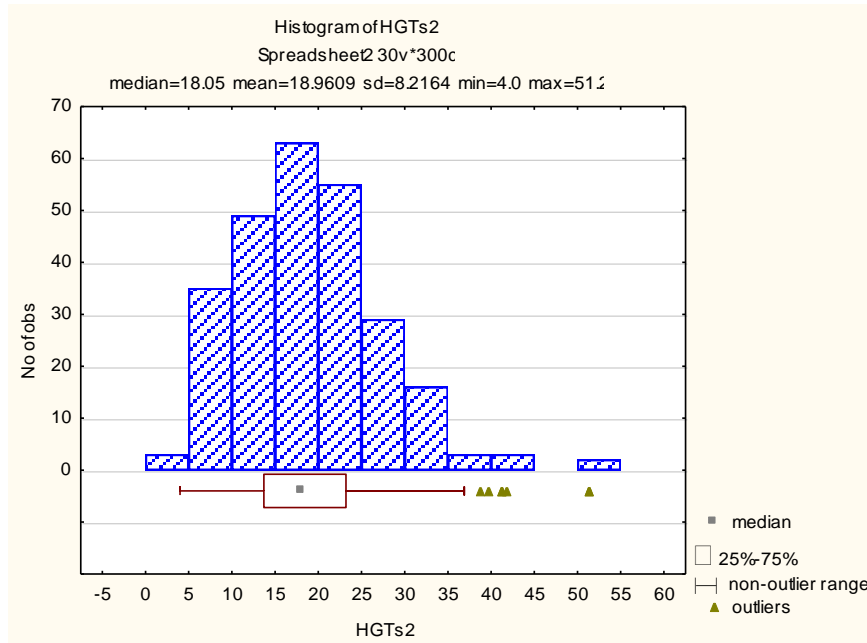
Figure 8: Categorized Histogram comparing diastolic blood pressure among participants in both clinics.



Obs=Observation

Comparing the 2 clinics i.e. Clinic H and Clinic L, 17% of the patients in Clinic H had diastolic BP less than 80, 71% of the patients had diastolic BP ≥ 80 and 13% of the other patients files where missing or DIAS BP was not done . In Clinic L, 15% of the sampled patients had diastolic BP < 80 while 73% of the patients had diastolic BP ≥ 80 and 13% of the patients had either their files missing or diastolic BP was not done.

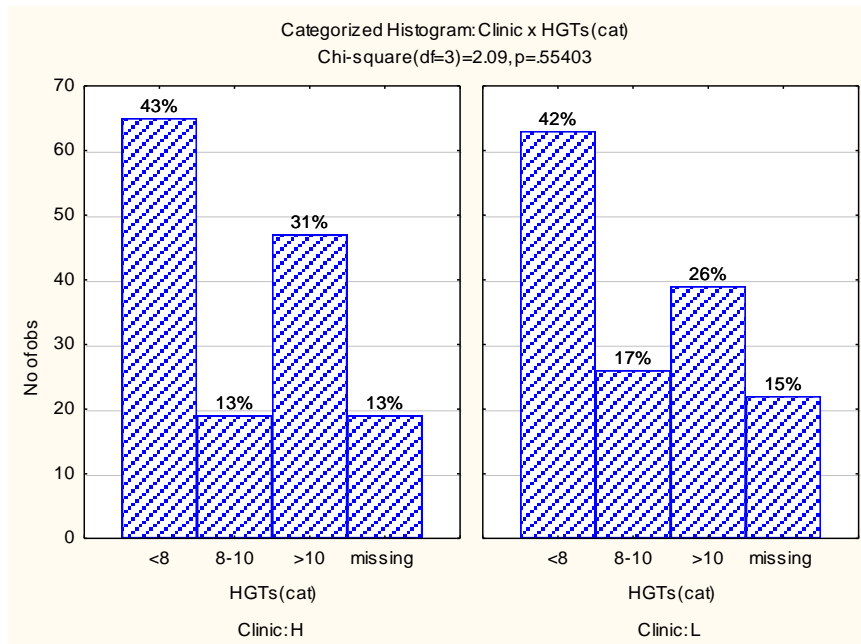
Figure 9: Random Hemoglucotests (HGTs) of participants in both clinics.



Obs=Observation. CI=Confidence Interval

There was more than one recording of random HGT per patient, the second HGT recorded for each patient was used to generate the above histogram, some patients had no recordings for this period and this led to the discrepancy as observed here with 41 missing observations. The mean random HGT = 18.9mmol/L and median was 18.05mmol/L. Minimum reading was 4.0mmol/L and maximum reading noted among patients was 51mmol/L. These reflected poor glycemic control among most patients. Std = 8.214, Std error = 0.522532; CI = 18-20.

Figure 10: Categorized Histogram comparing participants' random hemoglucotests in both clinics.



Obs=Observation

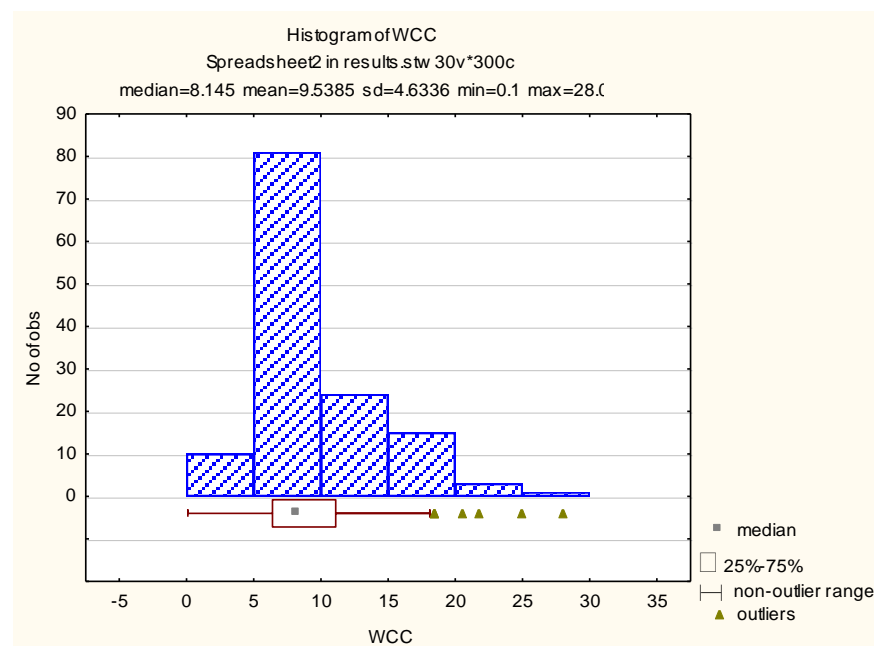
In comparing the 2 histograms of Clinic H and Clinic L , 43% of the patients in Clinic H had HGT less than 8 , 13% of the patients had HGT ranging between 8 and 10; 31% had HGT > 10 and 13% of the patients had their files missing or HGT was not done. While in Clinic L, 42% of the patients had HGT < 8, 17% of the sampled patients had HGT ranging between 8 and 10; 26% of patients had HGT > 10 and 15% of the patients had their files missing or HGT was not done .

Table III : Observed Frequencies of Male and Female Haemoglobin levels reflecting anemia

Marked cells have counts > 10. Chi-square				
SEX	HB(cat) normal	HB(cat) abnormal	HB(cat) missing	Row Totals
M	20	18	27	65
Row %	30.77%	27.69%	41.54%	
F	62	38	98	198
Row %	31.31%	19.19%	49.49%	
Totals	82	56	125	263

The above table reflects the gender distribution of anemia in the patients observed according to gender. 27% of male patients had anemia and 19% of females had anemia.

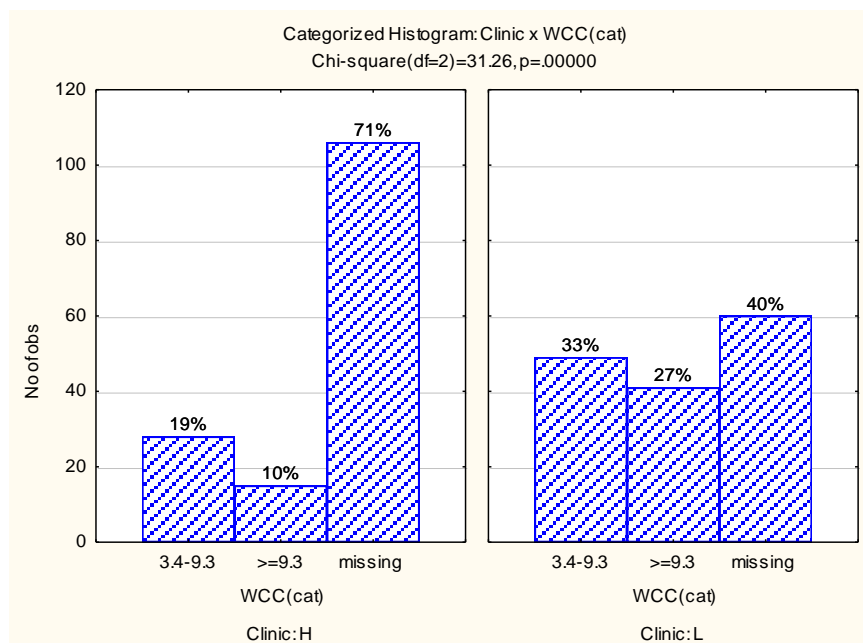
Figure 11: White cell count (WCC) distribution of participants from both clinics.



Obs=Observation.CI=Confidence Interval

Only 134 patients from both clinics had white cell counts done, patients who did not have a recording were not considered in the analysis. Total Number of observation (n) = 134 median= 8.145; Mean=9.5385; Std= 4.6336; Min=0.1, Max=28; Std Error = 4.00286, 95%CI= 8.8 – 10.3

Figure 12: Comparison of WCC levels of participants from both clinics.

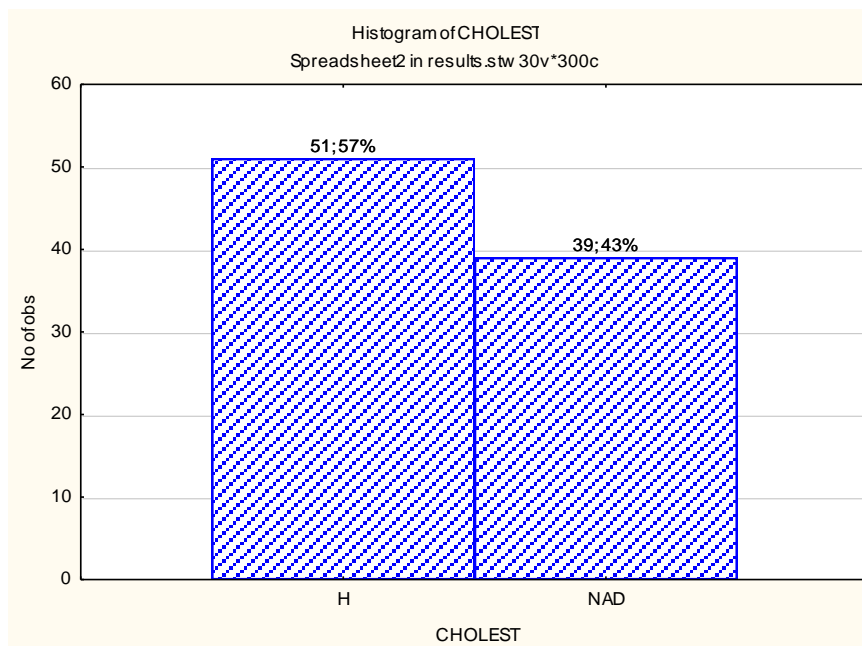


Obs=Observation

Comparing the 2 Clinics ,19% of the patients in Clinic H had WCC ranging between 3.4 and 9.3, 10% of the patients had WCC greater than 9.3 while 71% of the other patients had their files missing or WCC was not done . Whereas, in Clinic L, 33% of the patients had WCC ranging from 3.4 and 9.3 ; 27% had WCC greater than/= 9.3 and 40% of the other patients had their files missing or WCC was not done .

In assessing patients regarding how dietary advice was offered in both clinics, H block counselled 75 patients (57%) of 132 about diet i.e. 57 patients (43%) have no record of dietary advice in their files. In L block only 21 patients (16%) of 131 patients received dietary advice, 110 patients (84%) had no record of dietary advice in their folders.

Figure 13: Shows the number of patients with high cholesterol.



Obs=Observation

Total number of observations (n) = 90. Of these 51(57%) had high cholesterol levels and 39(43%) had no abnormality noted. In both clinics only 90 patients had

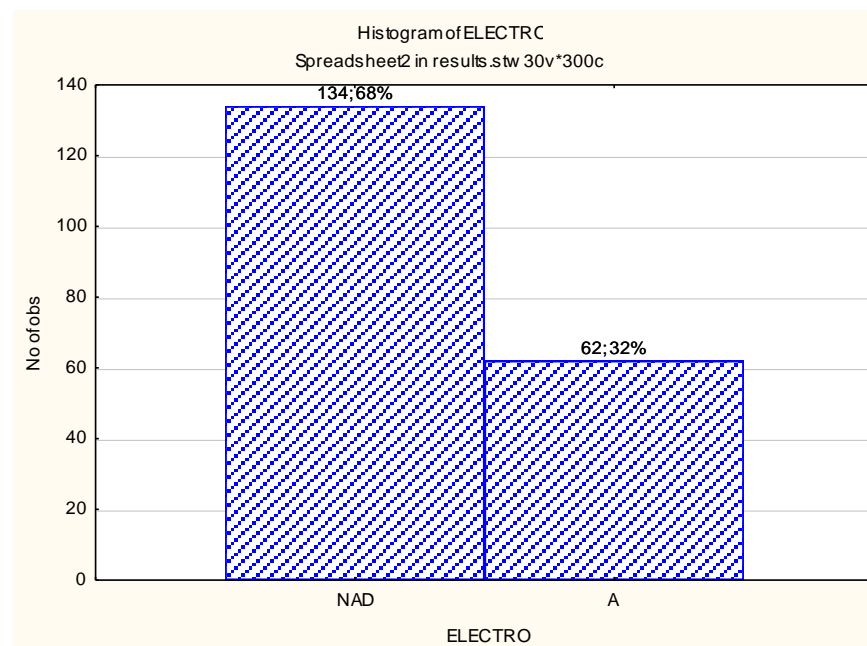
cholesterol levels assessed according to notes in their files. The percentages reflected here are of the patients who had their cholesterol levels checked.

Table IV: 2-Way Summary Table Observed Frequencies of cholesterol levels comparing only patients with cholesterol levels from both clinics.

Marked cells have counts > 10.			
Clinic	CHOLEST H	CHOLEST NAD	Row Totals
H	14	26	40
Row %	35.00%	65.00%	
L	37	13	50
Row %	74.00%	26.00%	
Totals	51	39	90

In H block of the 40 patients who had cholesterol levels checked only 14 had elevated cholesterol levels, in L block of 50 patients only 37 had elevated cholesterol levels.

Figure 14: Patients with abnormalities in their electrolyte levels.



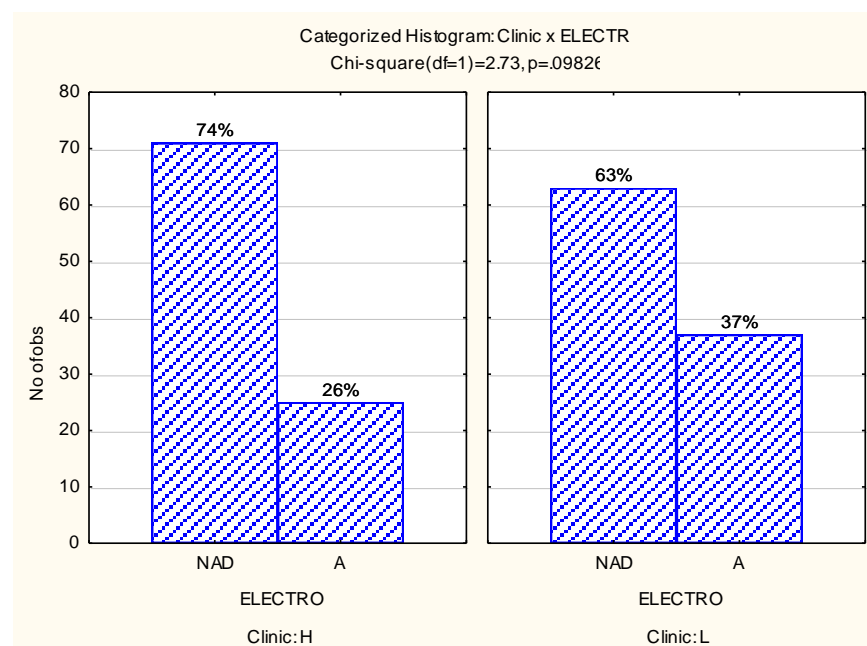
Obs=Observation

Total number of observation =196 i.e. the number of patients with electrolyte assays in both clinics. Of these 134(68%) had no abnormality in their electrolyte levels while 62(32%) had various types of electrolyte imbalance i.e. hyperkalaemia, hypokalaemia, hypernatraemia, hyponatraemia, hyperchloraemia and hypochloraemia.

Table V: 2-Way Summary Table: Observed Frequencies of electrolyte levels in the clinics

Marked cells have counts > 10.			
Clinic	ELECTRC NAD	ELECTRC A	Row Totals
H	71	25	96
Row %	73.96%	26.04%	
L	63	37	100
Row %	63.00%	37.00%	
Totals	134	62	196

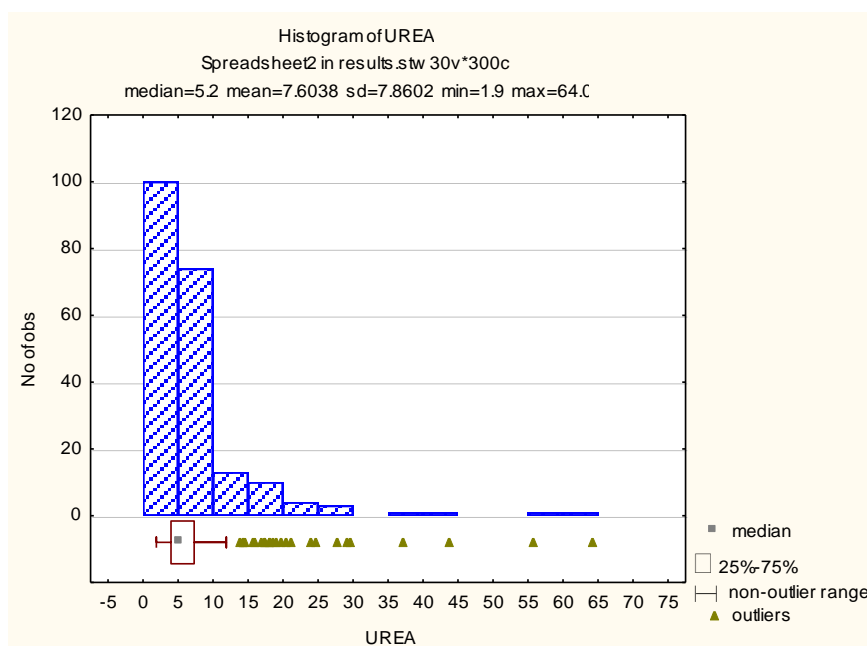
Figure 15: Categorized Histogram showing electrolyte levels amongst patients.



Obs=Observation

Histogram shows that in H-Block 74% had normal electrolyte, 26% had abnormal electrolyte levels. In L-Block 63% had normal electrolyte levels, 37% had abnormal electrolyte.

Figure 16: Distribution of urea levels among the sample population.



Obs=Observation

Total number of observation n=208. Median=5.2; Mean=7.6038; Min=1.9; Max=64.

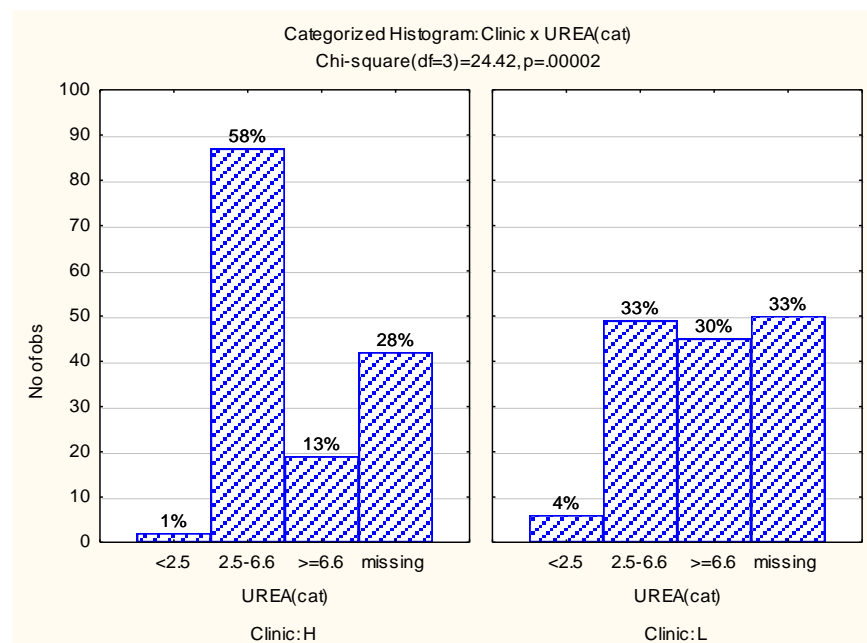
Std error= 0.545004 95% CI =7 – 9.

Table VI: 2 Way Summary Table, Observed Frequencies reflecting urea levels in both clinics

Marked cells have counts > 10. Chi-square(df=3)=24.42,					
Clinic	UREA(cat) <2.5	UREA(cat) 2.5-6.6	UREA(cat) ≥6.6	UREA(cat) missing	Row Totals
H	2	87	19	42	150
Row %	1.33%	58.00%	12.67%	28.00%	
L	6	49	45	50	150
Row %	4.00%	32.67%	30.00%	33.33%	
Totals	8	136	64	92	300

208 patients had urea levels checked in both clinics, 64 (31%) patients had elevated urea levels, 136 (65%) had urea levels within the normal range and 8 (4%) had subnormal levels.

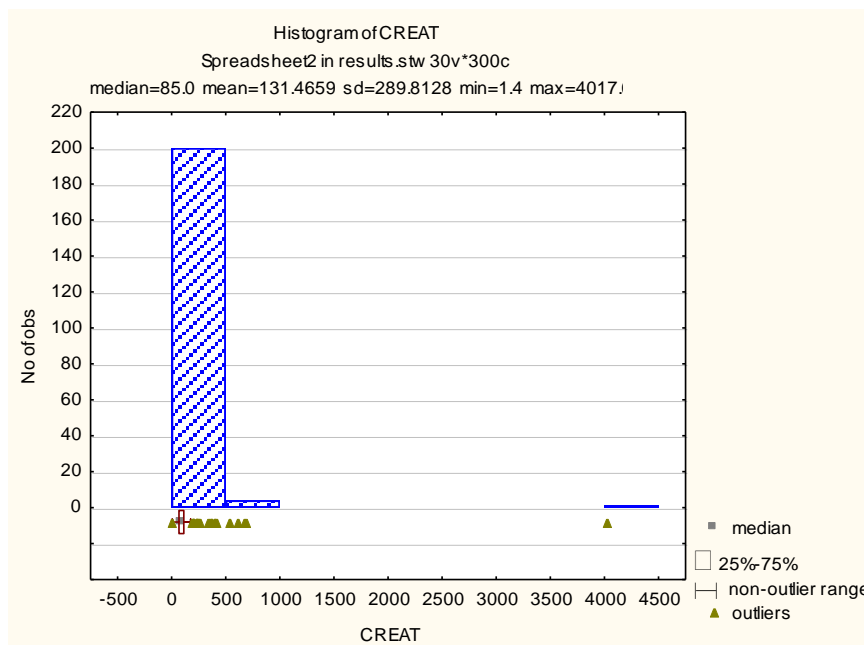
Figure 17: Comparison of urea levels among patients in both clinics.



Obs=Observation

In the Histograms, Clinic H shows that only 1% of the patient had UREA less than 2.5 while 58% of the patients had urea ranging between 2.5 and 6.6 , 13% of the patients had UREA greater than/= 6.6 (i.e. renal impairment) and 28 % of the patients had files missing or their UREA was not done . As compared to Clinic L, where 4% of the patients had UREA less than 2.5 , 33% of the patients had UREA ranging from 2.5 and 6.6, 30% had urea level ≥ 6.6 (i.e. renal impairment) while 33%of the sampled patients had their files missing or UREA was not done .

Figure 18: Distribution of Creatinine levels among patients from both clinics



Obs=Observation. CI=Confidence Interval.

Total number of observation $n=204$, Median = 850; Mean = 131.4659; Std=289.8128;

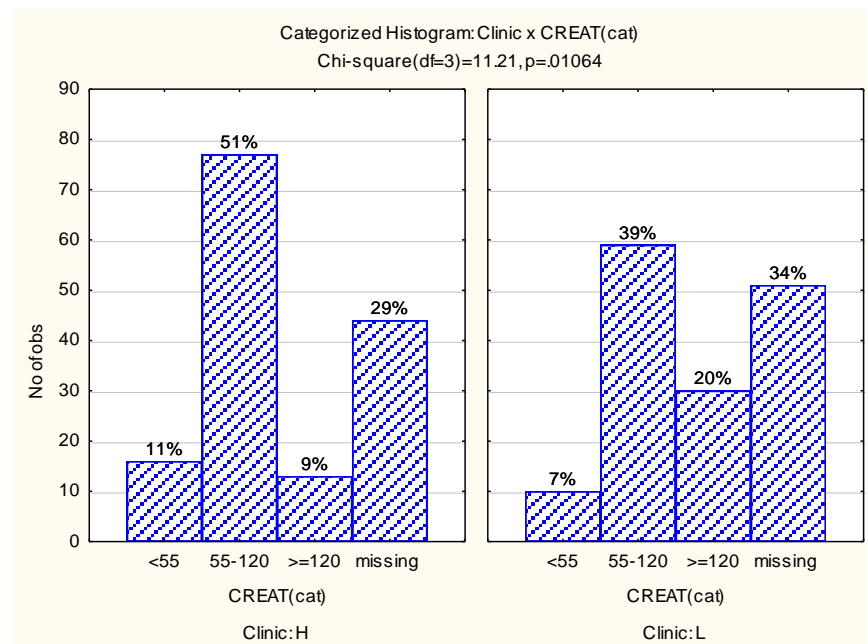
Min= 1.4; Max= 4017 95%CI=99 – 126 Std error= 6.88467; 95%CI=99 – 126 .

205 patients from both clinics had creatinine levels recorded in their folders, 43 patients from both clinics had elevated levels.

Table VII: 2-Way Summary Table: Observed frequencies of creatinine levels

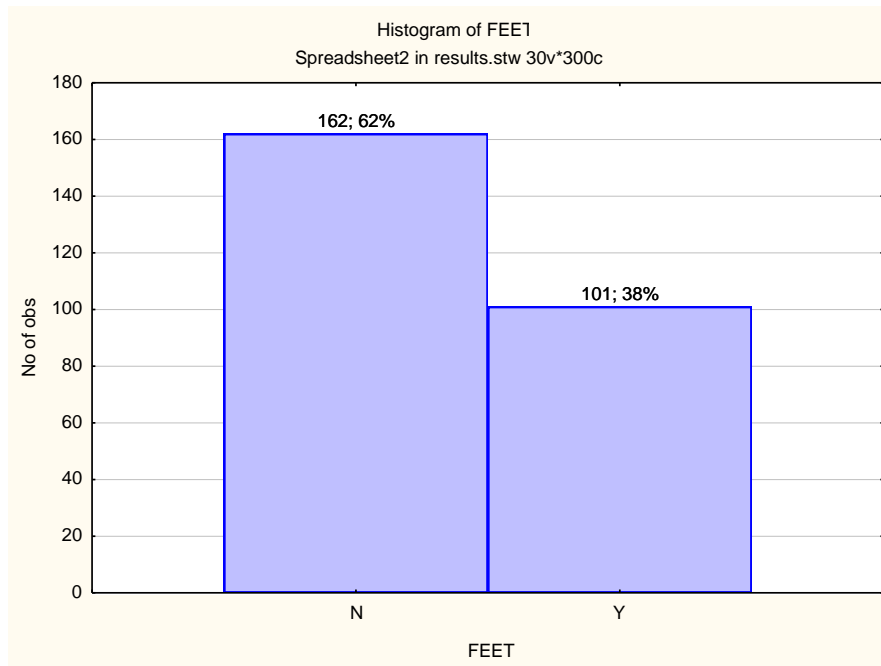
Marked cells have counts > 10. Chi-square(df=3)=11.21, p=.01064					
Clinic	CREAT (cat) <55	CREAT (cat) 55-120	CREAT (cat) ≥120	CREAT (cat) missing	Row Totals
H	16	77	13	44	150
Row %	10.67%	51.33%	8.67%	29.33%	
L	10	59	30	51	150
Row %	6.67%	39.33%	20.00%	34.00%	
Totals	26	136	43	95	300

Figure 19: Categorized Histogram comparing the creatinine levels of patients from both clinics.



Obs=Observation

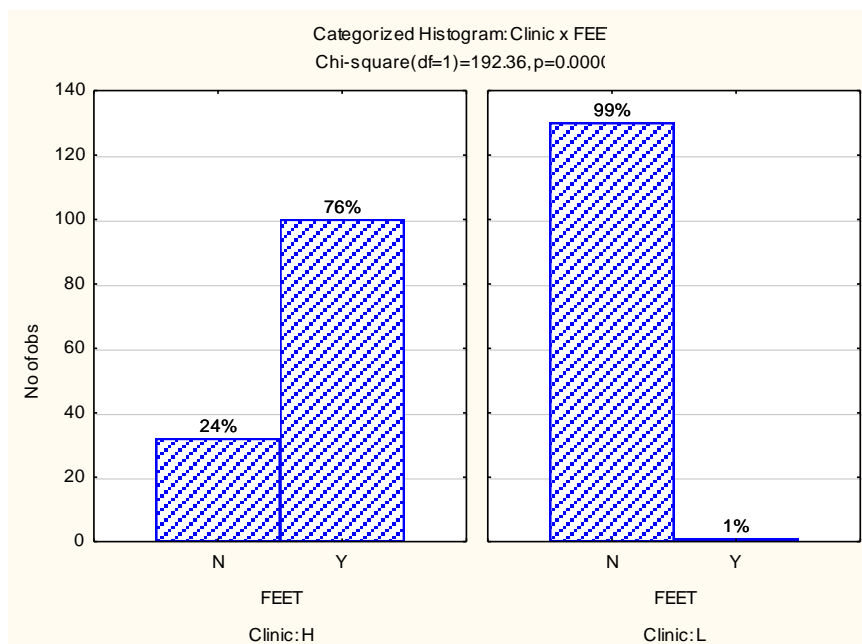
In comparing the two Histograms, Clinic H shows that 11% of the patients had creatinine less than 55, 51% of the patients had creatinine ranging between 55 and 120 (normal reference range), 9% of the patient had creatinine greater than



120(i.e. renal impairment) while 29% of the patients had their files missing or creatinine

was not done. Unlike 7% of the patients in Clinic L depicts that they had creatinine less than 55 , 39% of the patients in the same clinic had creatinine ranging from 55 to 120 , 20% of the patients had creatinine greater than 120(i.e.renal impairment), while 34% of the patients where missing or creatinine was not done.

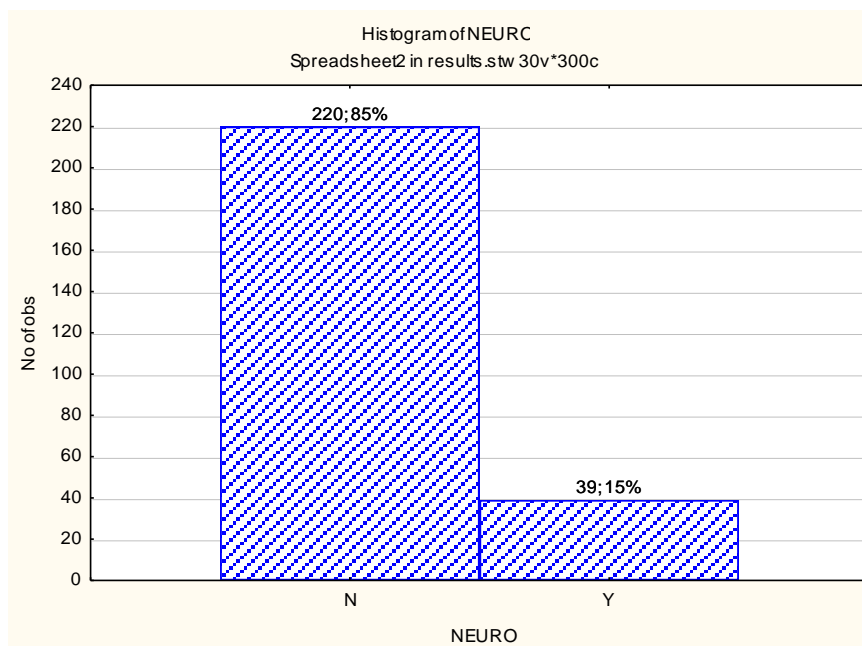
Figure 20: Categorized Histogram of feet examination.



Obs=Observation

In both clinics, 263 were patients observed only 62% of patients had feet checks in the year of study, 38% did not get feet checks. The majority of feet checks were done in H block where 76% of their patients had feet checks in L block only 1% of the patients assessed had feet checks.

Figure 21: The number of patients with neuropathy in both clinics.



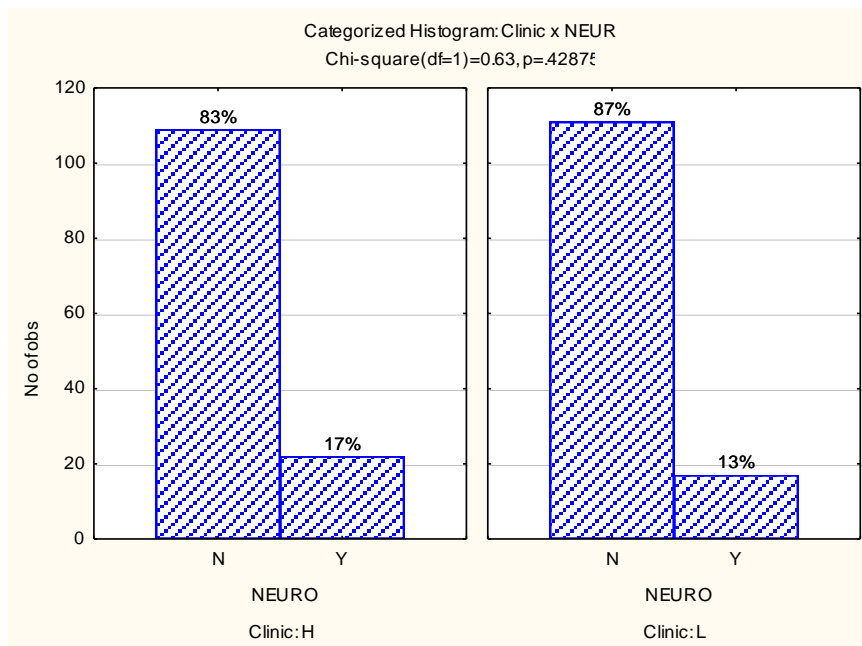
Obs=Observation

Total number of observation is n=259.

For the purpose of this study, neuropathy was defined based on a report of numbness in the extremities, pins and needles sensation in the extremities, erectile dysfunction, features of autonomic dysfunction like gastroparesis. Only 259 patients had any indication of whether or not they had features of diabetic neuropathy. Of these, 220 (85%) did not have any clinical evidence of neuropathy, 39(15%) had diabetic

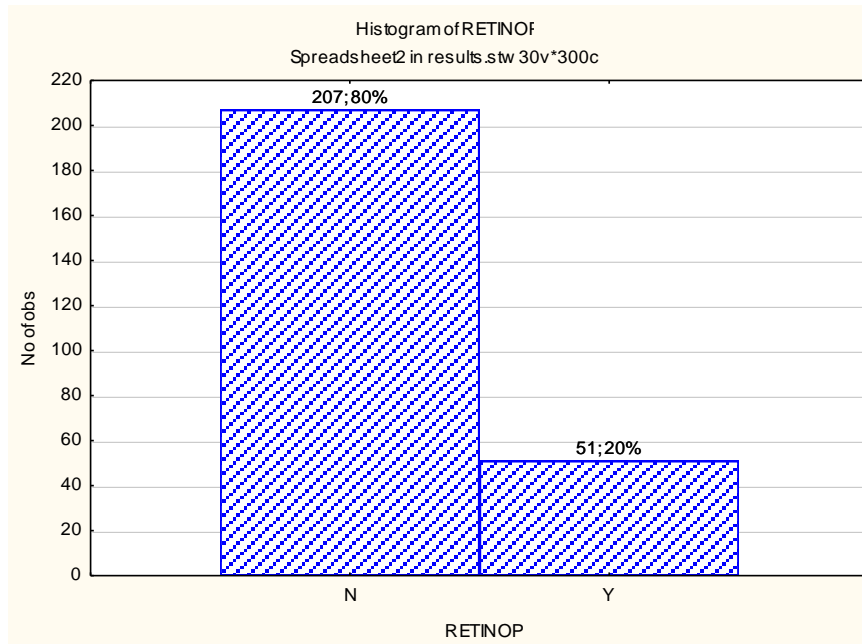
neuropathy of the extremities especially of the lower extremities, autonomic complications, e.g erectile dysfunction and gastroparesis.

Figure 22: Categorized Histogram: Neuropathy among patients in both clinics



Obs=Observation

In H-Block 83% did not have neuropathy, while 17% had neuropathy. In L-Block 87% did not have neuropathy while 13% had neuropathy

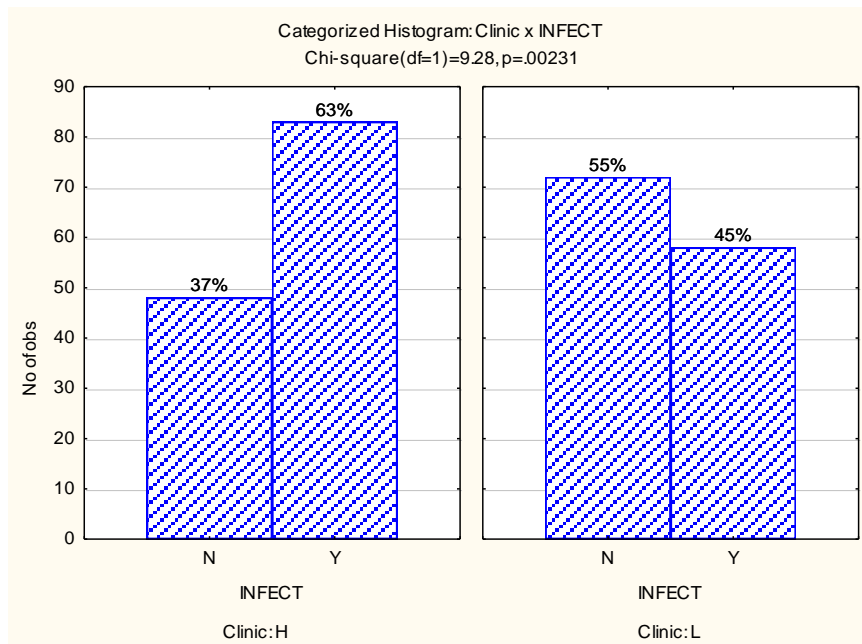
Figure 23: Shows number of patients with retinopathy.

Obs=Observation

Shows histogram of diabetic retinopathy Total number of observation n=258

Of these 207(80%) did not have diabetic retinopathy or had not returned with their reports from the ophthalmology unit; 51(20%) had diabetic retinopathy based on fundoscopy examination done at the ophthalmology clinic. The result is inconclusive/biased because most of the results from the eye clinic/ophthalmology unit did not return. 5 patients' records did not reflect whether or not they were assessed for retinopathy.

Figure 24: Showing patients with infection in either clinic



Obs=Observation

Histogram shows number of infection amongst diabetics in either clinic. In H block, 63% of patients observed had a record of an infection; in L block, 45% of patients had infections. The total number of observations were 263. Of these 46% did not have any infection; 54% had one form of infection or the other ranging from urinary tract infection (UTI), upper respiratory tract infection (URTI), abscesses to candidiasis. These findings were based solely on a report made by the doctor in patients notes.

A total of 263 folders were assessed for the presence or not of co morbidities. Of these 92.7% had various co morbidities ranging from hypertension (HPT), osteoarthritis (OA), gouty arthritis, asthma, epilepsy, Cardiomyopathy, etc Hypertension was the predominant co-morbidity with 126 (95%) patients in H block of 132 observations and 106 (81%) patients in L block of 131 observations were noted to be hypertensive. 232 (88%) of all observed patients were hypertensive. 19(7.3%) did not have any co morbidity recorded in their notes. In H block of 132 patients

observed, 123 had comorbidities and 9 had no comorbidities. In L block 120 had comorbidities and 11 had no comorbidities of the 131 patients observed.

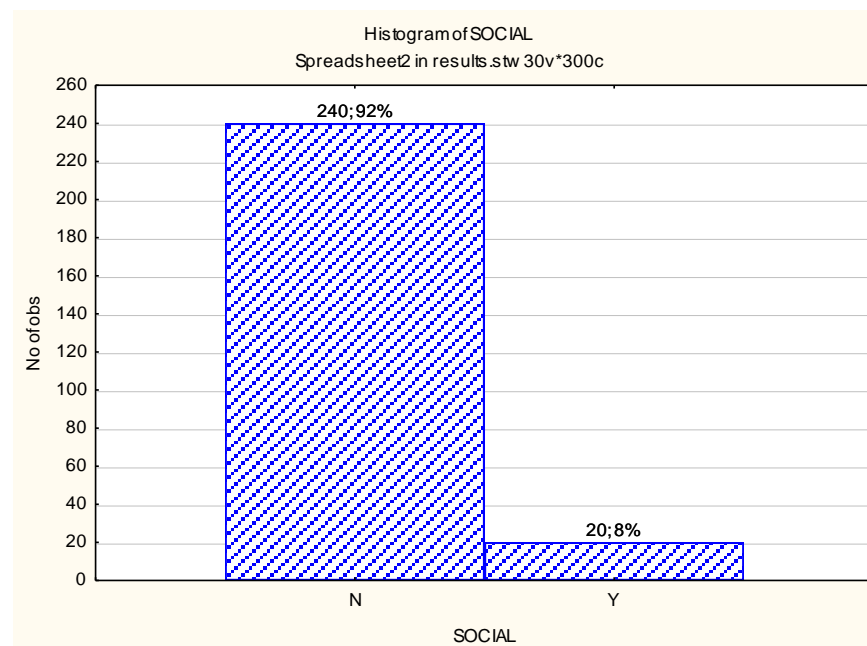
In H block 9 patients had both elevated urea and creatinine with hypertension, in L block 27 patients had both elevated urea and creatinine with hypertension. 36(15%) patients of all the patients 232 with hypertension had established nephropathy.

The total number of patients observed to have cerebrovascular accidents were 12(5%) in both clinics and all had hypertension as co morbidity to diabetes mellitus.

Ischaemic heart disease was present in 11(4%) of all patients observed, all had hypertension with diabetes mellitus. Congestive cardiac failure was recorded in 11(4%) patients and they all had hypertension with diabetes mellitus.

In assessing the profile of complications with lifestyle, a total of 74 patients had diabetes mellitus, hypertension and obesity according to the records. 57 (77%) patients had either microvascular or macrovascular complications 42 in H block and 15 in L block, 17 (23%) patients did not have a record of complications.

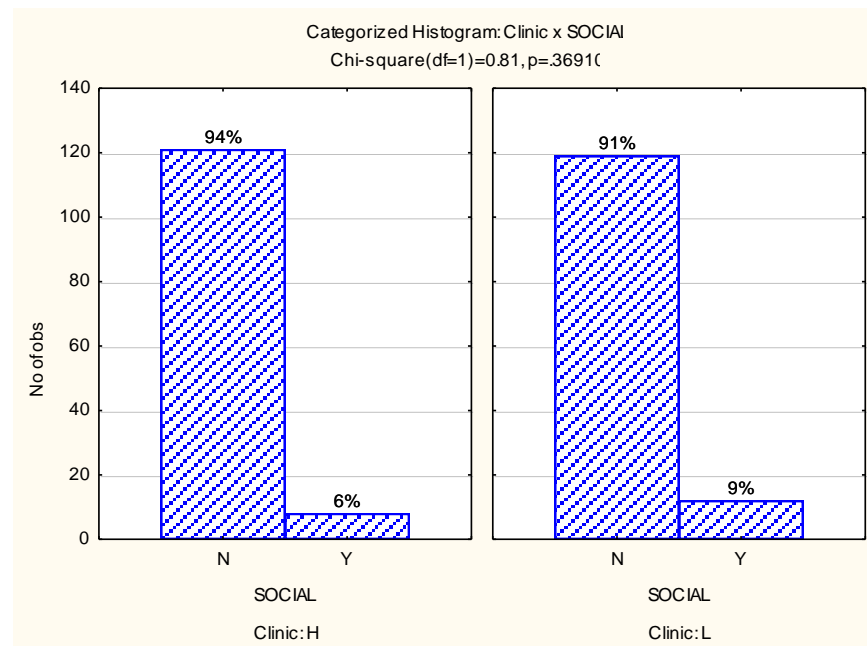
Figure 25: Patients with habits of cigarette smoking and alcohol use.



Obs=Observation

Total number of observation n=260 240(92%) denied any history of cigarette smoking or alcohol use while these habits were present in 20(8%) patients observed.

Figure 26: Comparison of patients in both clinics with social habits of cigarette smoking and alcohol use.



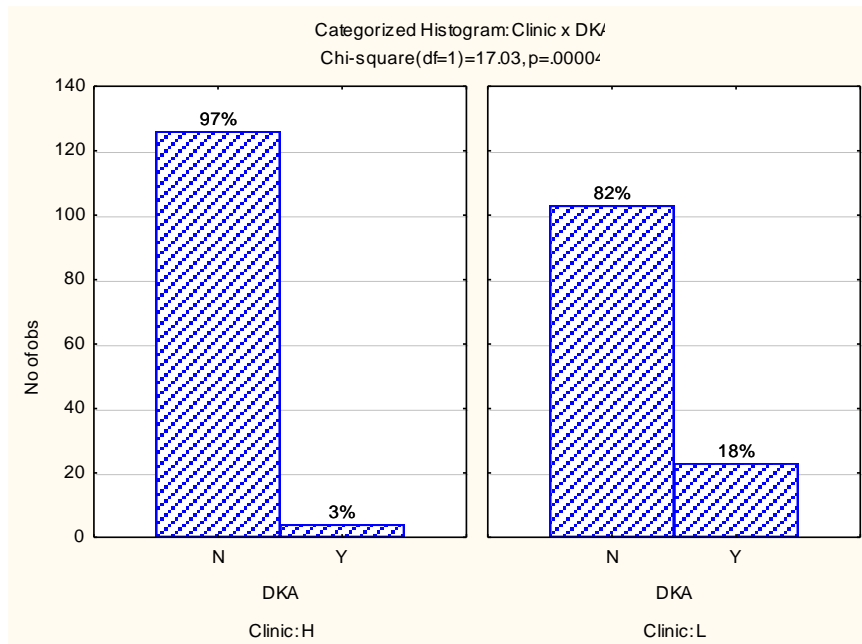
Obs=Observation

Shows histogram indicating that in H-Block 94% of the patient had no record of cigarette smoking or alcohol use, while 6% had these habits. In L-Block 91% did not have these habits while 9% had them present.

In assessing the profile of complications in patients with diabetes mellitus, hypertension and cigarette smoking with alcohol use; 20 patients were observed to have these factors present, 18 (90%) had either microvascular or macrovascular complications present and 2 (10%) had no record of complications. 8 patients with these factors were from H block all of them had complications, and 12 patients from L block 10 of these had complications and 2 had no complications

In assessing the records of patients for complications only (27)10% of patients in both clinics had a history of diabetic ketoacidosis 90% had no history of DKA.

Figure 27: Categorized Histogram of patients with Diabetic ketoacidosis..

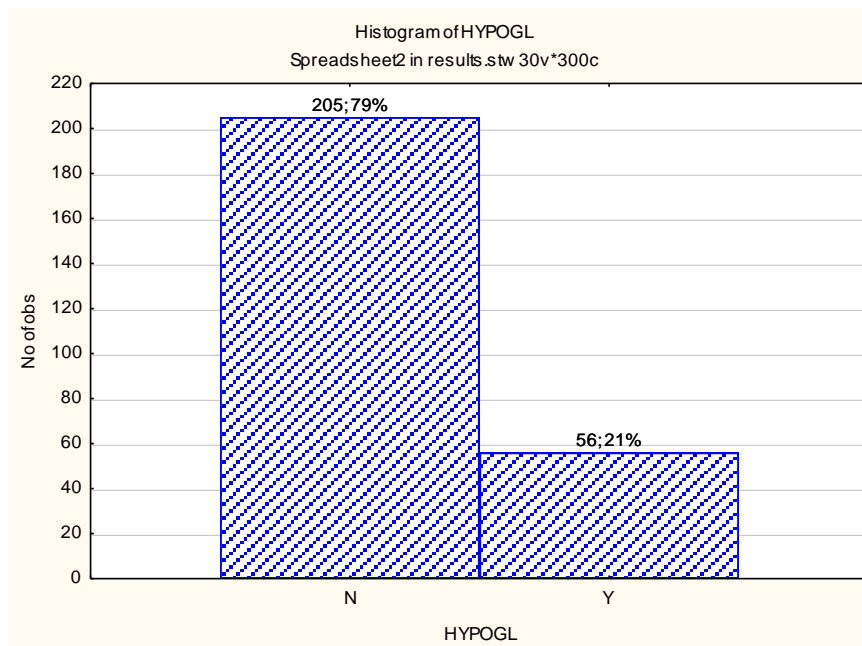


Obs=Observation

Shows histogram; indicating that 97% had no DKA complication while 3% had a history of DKA complication. In L-Block 82% did not have DKA complication, while 18% had a history of DKA complications.

In both clinics only 3(1%) patients of 263 observed patients had a history of hyperosmolar non ketotic coma.

Figure 28: Number of diabetics with a record of hypoglycemia.

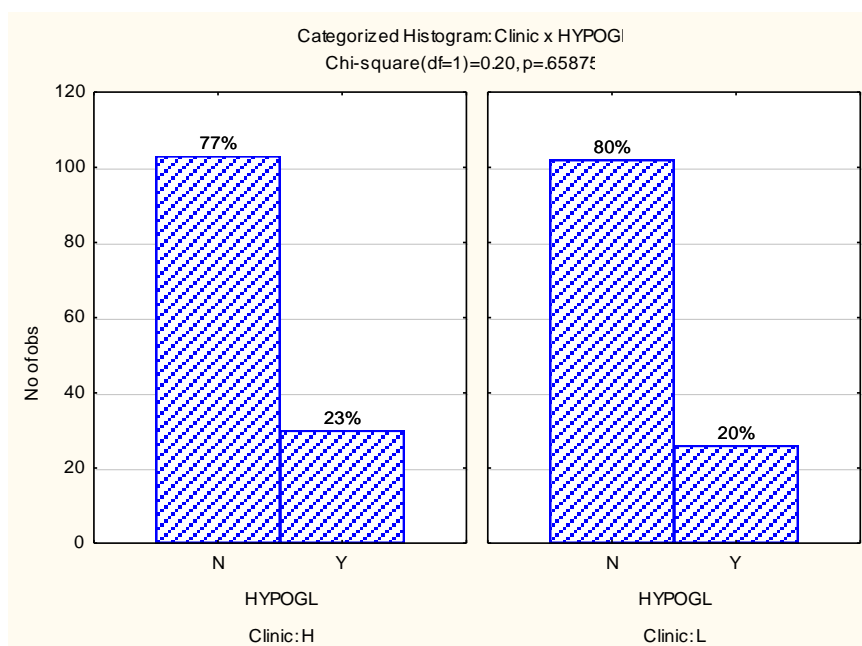


Obs=Observation

Total number of observations n=261, 205(79%) did not have hypoglycaemia;

56(21%) had hypoglycaemia . 2 patients had no recordings of hemoglucotest.

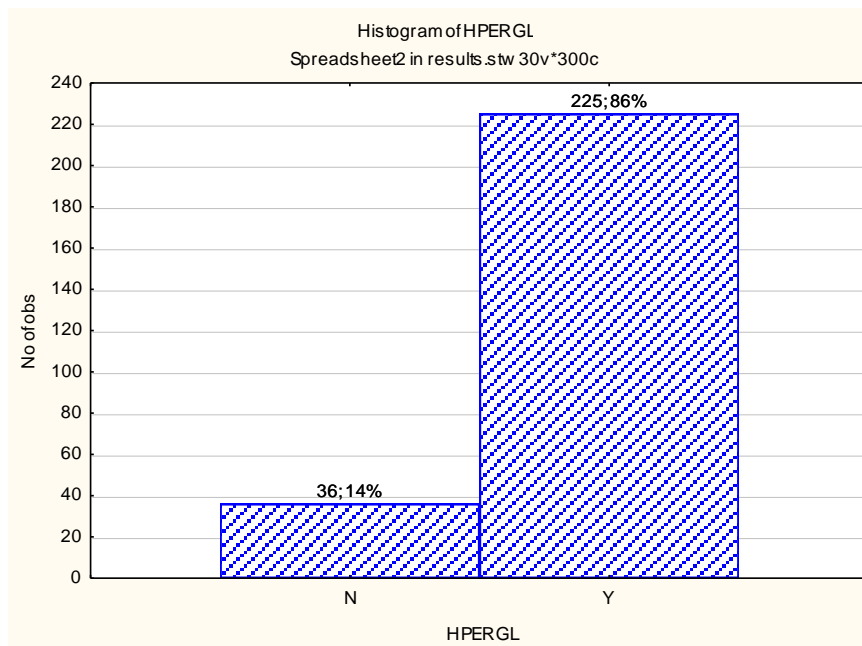
Figure 29: Categorized histogram of patients with hypoglycemia in both clinics..



Obs=Observation

Shows histogram indicating that in H-Block 77% did not have hypoglycaemia while 23% had hypoglycaemia. In L-Block, 80% did not have episodes of hypoglycaemia while 20% had episodes of hypoglycaemia.

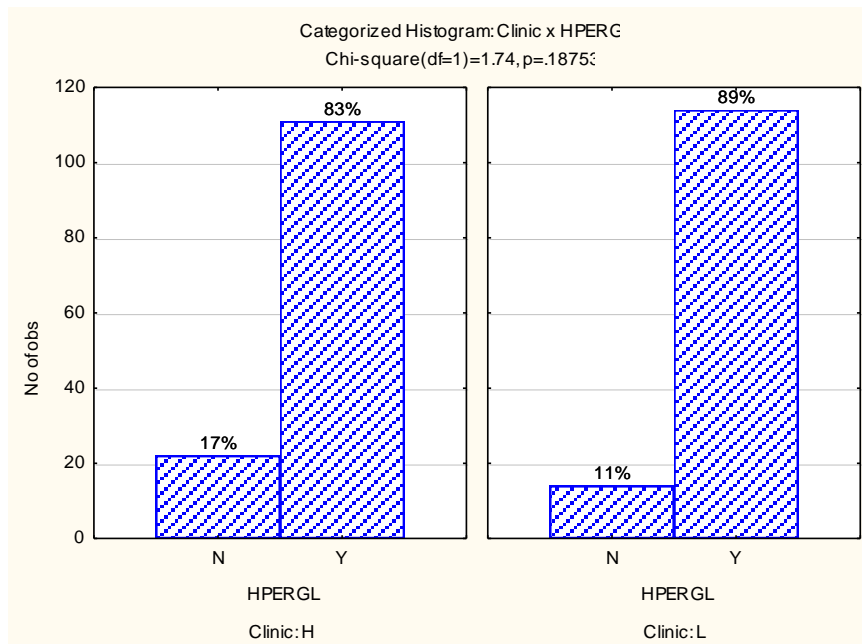
Figure 30: Shows number of diabetics with recorded episodes of hyperglycemia.



Obs=Observation

Total number of observation n=261. 225(80%) had hyperglycaemic levels recorded in year of study. 2 patients had no recorded observations..

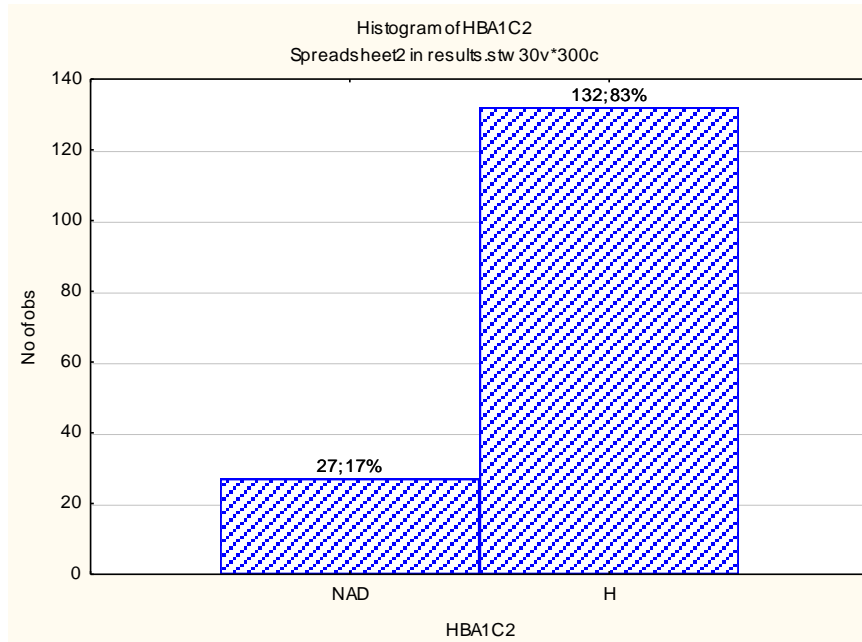
Figure 31: Categorized Histogram showing hyperglycemia in patients of both clinics.



Obs=Observation

Shows histogram indicating that in H-Block 17% did not have hyperglycaemic episodes, while 83% had hyperglycaemic episodes. In L-Block 11% did not have hyperglycaemia while 89% had hyperglycaemia predominantly one year after diagnosis of diabetes and while patients were still on oral hypoglycaemic agents.

Figure 32: Shows distribution of patients with elevated glycosylated haemoglobin (Hb A1c) in the preceding 3 months..



Obs=Observation

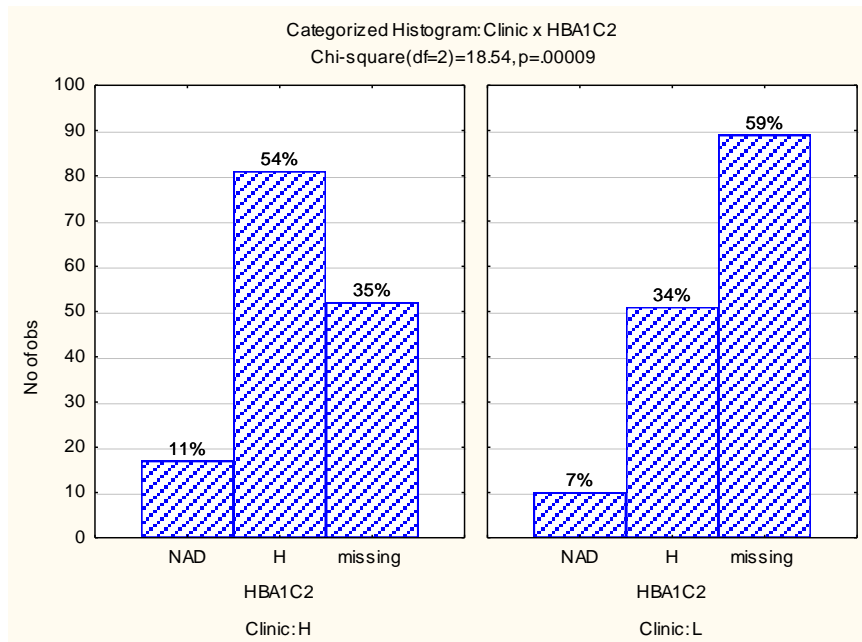
Total number of observations in folders n=159 .132(83%) had elevated HbA1c levels.

27(17%) had normal HbA1c level.

Table VIII: A 2-Way Summary Table of observed frequencies of Hb A1c levels

Marked cells have counts > 10. Chi-sq				
Clinic	HBA1C2 NAD	HBA1C2 H	HBA1C2 missing	Row Totals
H	17	81	52	150
Row %	11.33%	54.00%	34.67%	
L	10	51	89	150
Row %	6.67%	34.00%	59.33%	
Totals	27	132	141	300

Figure 33 : Shows a comparison of HbA1c levels between patients of both clinics



Obs=Observation

The 2 Histogram shows HbA1c from Clinic H and Clinic L. 11% of the patients in Clinic H had normal HbA1c ; 54% of the patients had elevated HbA1c and 35% had their files missing or HbA1c was not done. As compared to Clinic L, 7% of the patients had normal HbA1c; 34% of the patient had high HbA1c while 59 % of the patients' files were missing or HbA1c was not done.

.DISCUSSION OF RESULTS.

In this study the age range of the patients is from 18 to 90 years with a median age of 59.0years. (See Fig 1). A total of 263 patients were observed in both clinics, 65 patients (25%) were male and 198(75%) females. (See Fig 2). In H block there were 25 males and 107 females, L block had 40 males and 91 females. The patients were classified into type 1 and type 2 diabetes mellitus, 257 of the total number were classified 19% were type 1 diabetes mellitus patients and 81% were type 2 diabetes mellitus patients. This confirms the preponderance of diabetes mellitus type 2. This compares favourably with the EURODIAB prospective complication study²⁸ in which type 2 diabetes mellitus accounted for 95% of cases.

The mean weight of patients was 83kg the minimum weight recorded was 44 kg and the maximum 150kg. See Fig 4. Only 10 patients had their heights measured, this made it impossible to draw any conclusion on the BMI of patients in both clinics. However, based on clinic records, some patients were classified as obese and this was used to assess the profile of complications in these patients.

246 (82%) of patients from both clinics were noted to have systolic BP > 130mmHg, 38 patients (13%) either did not get BP checks or had their folders missing, only 16 patients (5%) had systolic blood pressure within normal limits. (See Fig 5)

47 patients (16%) had diastolic BP < 80mmHg, 215 patients (72%) had diastolic BP > 80mmHg, 38 patients (13%) of patients had missing BP or missing files. (See Fig 7)

Hypertension was identified as a comorbidity in 232 patients in this study, according to patient records, the elevated blood pressure readings reveal that blood pressure control was not achieved adequately in these clinics. Tight blood pressure control has been identified in studies to lower the risk of developing complications in diabetes mellitus.¹⁴

Anaemia was present in 27%(18) of male patients and 19%(38) of female patients that had these records available. (See Table III). Anemia as indicated by Hb of <12g/dL in females and 13g/dL in males. Even though the men had a higher percentage the women were more in number who had recorded history of anemia.

In this study, 56.41% of patients had infections of various forms e.g urinary tract infection(UTI), upper respiratory tract infections(URTI) etc, while 43.59% did not have infection. 56.4% of females had infection compared to 47.6% of males. In a similar study in Papua, New Guinea²⁵ recorded deaths in Diabetic patients were usually due to infection, gangrene and metabolic complications.

Renal impairment indicated by high level of urea in 21% patients(See Fig 20) and creatinine in 43(14%) of patients was noted. 92(31%) either did not have bloods taken or had missing files. 21% of patients from both clinics had creatinine levels >120 Renal impairment including prerenal, renal and post renal were grouped together in this study. The findings are similar to the study by AJG Hanley et al²⁷. This is indicated by continuous elevation of urea and creatinine respectively with urea greater than 6.6mmol/L and creatinine greater than 120.

The findings of this study reveal the higher prevalence of micro vascular and macro vascular complications in patients with poorly controlled diabetes mellitus. The frequency of diabetic complications is significantly correlated with HbA1c values - Stratton et al 2000⁶. In this study HbA1c was elevated in 132(44%) of the patients.(See Table VIII) indicating poor glycemic control in these patients. 41(47%) of patients did not have their HbA1c investigated or had missing files only 27 patients (9%) had HbA1c within normal limit. The random hemoglucotests of patients in both clinics revealed that in H block 31% of patients had levels higher than the 10mmol/L, L block had 26% with random HGTs higher than 10mmol/L(See Fig 10).

Hypoglycaemia was noted in 21% of patients and hyperglycemia was noted in 86% of patients with random HGTs. Tight control in diabetes mellitus causes a higher prevalence of hypoglycaemia as seen in the study by Fritsche et al 2004⁸

This study shows that 20 (8%) patients had social habits which were cigarette smoking and alcohol use for this study. (See Fig 25) These patients also had hypertension as a recorded comorbidity with diabetes mellitus in their records.

18(90%) of them had recognised complications (microvascular and macrovascular complications) recorded in their notes and 2(10%) were without complications. This confirmed the findings of the JDCS that identified smoking as a risk factor for the development for CHD and other microvascular and macrovascular complications.^{12,23}.

251(95%) of patient had co morbidity such as HPT predominantly complicating their diabetes while 14(5%) did not have any co morbidity. The presence of hypertension in patients included in this study was associated with complications, worthy of note is the fact that all patients with cerebrovascular accident, ischaemic heart disease and congestive cardiac failure in this study were hypertensive and diabetic. 74 patients with hypertension and diabetes mellitus were identified in their clinic records as being obese. 57 (77%) of the patients with obesity, hypertension and diabetes mellitus were noted to have microvascular and macrovascular complications, while 17 (23%) did not have any recorded complications. This confirmed the findings of other studies that confirm the increased risk of complications in diabetics with hypertension.^{13, 14, 15, 16}.

51(57%) had elevated cholesterol levels, while 39(43%) had normal cholesterol levels. (See Fig 13). High LDL cholesterol levels, hypertension and smoking are identified significant risk factors for coronary heart disease. The criteria for identifying patients with high cholesterol include persistent elevation of total cholesterol > 5mmol/L, triglycerides of > 1.5 mmol/L and low density lipoprotein

(LDL) cholesterol > 3.0mmol/L. Optimal high density lipoprotein (HDL) level of greater than or equal to 1.2mmol/L was seen as target level in this study.

3(1%) patients had Hyperosmolar non ketotic coma (HONK), 27(11%) had Diabetic ketoacidosis(DKA) episodes recorded in their files.(See Fig 27). According to a study done in Papua New Guinea in conjunction with Royal Melbourne Hospital (RMH) patients generally seek medical help late, being relatively asymptomatic because of the resistance to diabetic ketosis in type 2 diabetic patients. Hence, microangiopathic complications are frequently noted at initial presentation²⁵.

39 patients (15%) had neuropathy for example, erectile dysfunction, numbness on the feet etc, while 220 patients (85%) did not have neuropathy.(See Fig 21). The American diabetic association revealed that neuropathy in diabetics is 10% and that this worsened with the duration of diabetes²⁹ (<5years – 7.9%, 5- 9 years- 14.1%, 10 – 19 years 13.3% and at 22 years 28.1%). The French multicentre study³⁰ noted that autonomic neuropathy can affect various organs. The disabling propensity of cardiac autonomic neuropathy (CAN) was put at enormous proportions. However in this study CAN was not described.

51 patients (20%) had retinopathy, while 207(80%) did not have retinopathy-this is inconclusive as most patients sent for fundoscopy did not report back from the eye clinic with fundoscopy findings.(See Fig 28). The JDCS, 1996 showed that HbA1c level and duration of Diabetes in patients with diabetes mellitus are risk factors for retinopathy and mortality.

These findings vary from findings of A.J.G Hanley²⁷ in which neuropathy was 46.3%, and 23.3% of the population had retinopathy.

Comparing the two clinics, 19% of the patients in H- Block were males and 81% were females while in L- Block 31% were males and 69% were females.

In H- Block 21% did not have dietary advice while 79% had dietary advice .In the L - Block 52%did not have dietary advice while 40% had dietary advice. Only 10 patients of the 300 patients sampled had their heights measured i.e. 1 in H-block and 9 in L block. The study had to rely on clinical records of obesity in patients for risk profiling..

In H-Block, 24% did not have feet examination while 76% had feet examination. In L-Block, 99% did not have feet check while 1% had feet examination. (See Fig20) This I considered an unfortunate circumstance as it is a very important tool¹⁶ in assessment of diabetics to have regular feet examination and this was a tool not used adequately in either one of the clinics although H block conducted more feet checks than L block that used this tool in only 1% of the patients observed in the clinic.

In H-Block 37%had no infection, while 63% had infection.(See Fig 24). The infections noted among the diabetics in H block include; pulmonary tuberculosis, septic sores, retroviral disease, bronchopneumonia, urinary tract infection, pharyngitis/tonsillitis, skin abscesses. In L-Block 55%did not have infection while 45%had infection. The infections noted among patients in L block include retroviral disease (RVD), bronchopneumonia (BPN), pulmonary tuberculosis (PTB), cellulitis, conjunctivitis, pharyngitis and urinary tract infection (UTI).

Co morbidities noted in H-Block include obesity, epilepsy, asthma, chronic obstructive pulmonary disease, cardiovascular accidents cardiomyopathy, gouty arthritis and rheumatoid arthritis. In L-Block the co morbidities noted include left ventricular failure, peptic ulcer disease cardiovascular accidents, epilepsy, congestive cardiac failure, gouty arthritis, osteoarthritis, rheumatoid arthritis, dementia, 3 patients had below knee amputations due to diabetic foot ulcers. Further comorbidities noted in L block include cancer of the prostate, asthma, chronic obstructive pulmonary

diseases, cardiomyopathy, carcinoma of the vulva, obesity, deep vein thrombosis, ischaemic heart disease, Bell's palsy, Grave's disease chronic renal failure, benign prostatic hypertrophy, incisional hernia and gastroesophageal reflux disease. The list of comorbidities identified among the patients in L block indicate that patients were dealing with more severe pathology, this is due to the fact that L block functions as a secondary level of care clinic and so patients are usually have more difficulty achieving control with more severe risk profile, while H block is a primary care clinic and patients are down referred from L block to the H block.

Bias

This study has some limitations:

- Diabetic patients seen at emergency or casualty unit and other departments as at the time of the study were not included in the study so not all adult diabetics that present to the hospital were represented in the sample population.
- This study was dependent on the ability of staff in the clinics to keep good records.
- Patients whose files were missing at the time of the study were not included in the study
- Patients also attending the diabetic clinic a specialist clinic for Diabetics were not included in the study.
- Patients whose fundoscopy results were still at the Eye clinic did not have the information included in the study

For future studies these categories of patients should be included and this may significantly influence statistical findings.

CONCLUSION.

In South Africa diabetes is an important direct and indirect cause of burden. Primary prevention of the diseases through multilevel interventions and improved management at primary health care level are needed. South Africans aged greater than or equal to 30 yrs, 5.5% had diabetes which increased with age. Overall, about 14% of Ischaemic heart disease (IHD), 10% of stroke, 12% of hypertensive disease and 12% of renal disease burden in adult males and females are attributable to diabetes.²²

However, in this study elevated blood glucose level is the most significant complication with concomitant elevated HbA1c. Type 2 diabetics were more in this study similar to the EURODIAB study.

The clinics sampled in the study are noted to have suboptimal management protocols, only 1% of sampled patients in L block had feet checks in the year of study.

Ophthalmology clinic reports were not returned on schedule for patients who had fundoscopy assessments.

Hypertension was demonstrated as a very common comorbidity among diabetic patients in the study. The risk profiles assessed with obesity and cigarette smoking with alcohol use confirmed the findings of other studies reviewed that the presence of these factors increased the risk of developing complications of diabetes mellitus..

RECOMMENDATIONS

Dora Nginza Hospital DNH management board will need to address the following shortfalls:

- Recalling that the results of the fundoscopy are inconclusive supports need for efforts to be made to ensure that patients who are sent for fundoscopy at the sister hospitals in PEPH are sent back to referring doctors with documentation of findings. Better still, clinicians in these clinics can have refresher courses to improve their skills in examination of the eye, so they can conduct fundoscopies without needing to refer patients to the ophthalmology unit. This way they can diagnose diabetic retinopathy early and refer patients early for specialist management at the ophthalmology clinic.
- Results also show that the medical out patient department is doing far less as compared to the family medicine out patient department in certain aspects of patient care. For example, feet check, bloods taken for HbA1c and other routine bloods. This means education of staff is required to improve the quality of care at these clinics. As part of the effort to improve this, an audit of patient management for diabetes mellitus in the 2 clinics will follow this study. Targets for the audit will be set based on the findings of this study and in conjunction with the staff of both clinics.
- In the area of records and filing, quite a number of patients files whose names were randomly drawn from the register in the clinics were missing. For H-Block 18 files and 19 for the L-Block. Facilities must be put in place to ensure appropriate filing and safe storage of patient records. Losing patients' records makes optimal management of their chronic conditions impossible.

- Compliance of the patient must be ensured through education and demonstration for instance of how to mix insulin solutions and injecting same at appropriate sites of the body. The need for adequate storage of insulin and other drugs must be sourced in these clinics and encouraged among patients in their own homes. This can be accomplished by the use of peer educators, nursing staff trained to educate patients and the development of support groups.
- Most patients did not have dietary counselling by the doctors. Every diagnosed diabetic must be assessed by a dietician for counselling on the same visit that they are diagnosed or early appointments made. A dietician should be available at both clinics to allow for ease of referrals.
- Only 10 patients of the supposedly 300 population sampled had their heights measured through out their visits, hence, BMI could not be ascertained for a reasonable number of patients. Efforts must be made to ensure that all patients are weighed and their heights measured and then BMI determined through calculation using the formula $\text{weight (kg)} / \text{height}^2 (\text{m}^2)$. Those who have aberrant BMI should receive counselling for lifestyle modification like exercise, diet and regular follow up.
- UTI featured prominently amongst the infections noted among the patient populations. Syndromic management of sexually transmitted disease needs to be encouraged in the clinics through education of the patient.
- It is important to attain good blood pressure control in all diabetic patients. as uncontrolled blood pressure is known to increase the risk of developing complications and this comorbidity featured prominently in both clinics in this study.

REFERENCES

1. Cheung N, Wang JJ, Klein R et al. Diabetic retinopathy and the risk of coronary heart disease: the Atherosclerosis Risk in Communities Study. *Diabetes Care*. 2007 Jul;**30**(7):1742-6. Epub 2007 Mar 26. Erratum in: *Diabetes Care*. 2007 Oct;**30**(10):2762. PMID: 17389333 [PubMed - indexed for MEDLINE]
2. King H, Rewers M. Global estimates for prevalence of diabetes mellitus and impaired glucose tolerance in adults. WHO Ad Hoc diabetes reporting group. *Diabetes care* 1993;**16**:157-177.
3. E- atlas 2nd edition. International diabetes federation.(IDF) Wong T, Cheung et al. Prevalence and Risk Factors for Diabetic Retinopathy; the Singapore Malay eye Study.
4. Cantˆn A, Fernˆndez Castaˆer M, Conget I et al. Type 1 diabetes mellitus in Catalonia: Chronic complications and metabolic control ten years after onset. *Med Sci Monit*. 2004 May; **10**(5):CR185-90. Epub 2004 Apr 28.PMID: 15114267 [PubMed - indexed for MEDLINE]
5. Arfken CL, Reno PL, Santiago JV, Klein R. Development of proliferative diabetic retinopathy in African-Americans and whites with type 1 diabetes. *Diabetes Care*. 1998 May;**21**(5):792-5. PMID: 9589242 [PubMed - indexed for MEDLINE]
6. Stratton I, Andrew W. et al. Association of glycemia with macrovascular and microvascular complications of type 2 diabetes. (UKPDS 35). Prospective observational study. *BMJ* August 2000, 321 (7258): 405-412.

7. Brinke R, Dekker N. et al. Lowering HbA1c in Type 2 Diabetics results in reduced risk of Coronary Heart Disease and all cause mortality. *Primary Care Diabetes*, volume 2, Issue 1, 45-49.
8. Fritsche A. Mathias Axel S. et al. Correlation between Hemoglobin A1c and mean plasma glucose levels *The Journal of Family Practice* May 2004. vol 53, no 5.
9. Boelter MC, Gross JL, Canani LH, et al. Proliferative diabetic retinopathy is associated with microalbuminuria in patients with Type 2 Diabetes. *Braz J Med Biol Res*, August 2006, vol 39(8) 1033-1039.
10. Williams KV, Erbey JR, Becker D et al. Improved glycemic control reduces the impact of weight gain on cardiovascular risk factors in type 1 diabetes. The Epidemiology of Diabetes Complications Study. *Diabetes Care*. 1999 Jul;**22**(7):1084-91.
PMID: 10388972 [PubMed - indexed for MEDLINE]
11. Kramer CK, Leitaó CB, Pinto LC, et al. Clinical and Laboratory profile of patients with type 2 Diabetes with low glomerular filtration rate and normoalbuminuria. *Diabetes Care*, April 2007, 30: 1998-2000.
12. Nicolucci A, Carinci F, Ciampi A. Stratifying patients at risk of diabetic complications: an integrated look at clinical, socioeconomic, and care-related factors. SID-AMD Italian Study Group for the Implementation of the St. Vincent Declaration. *Diabetes Care*. 1998 Sep;**21**(9):1439-44.
PMID: 9727888 [PubMed - indexed for MEDLINE]
13. Bakris GL, Weir MR, Shanifar S, et al. Effects of blood pressure on progression of diabetic nephropathy. *Arch. Intern. Med*. 2003; 163: 1555-1565
14. Al-Maskari F, El-Sadig M, Norman JN. The prevalence of macro vascular complications among diabetic patients in the United Arab Emirates.

Cardiovasc Diabetol. 2007 Sep 19;**6**:24.

PMID: 17880686 [PubMed - indexed for MEDLINE]

15. Raikou M, Gray A. et al. UK Prospective Diabetes Study Group. *BMJ* 1998; 317: 720-726

16. Raile K, Galler A, Hofer S et al. Diabetic nephropathy in 27,805 children, adolescents, and adults with type 1 diabetes: effect of diabetes duration, A1C, hypertension, dyslipidemia, diabetes onset, and sex. *Diabetes Care.* 2007 Oct;**30**(10):2523-8. Epub 2007 Jul 13.

PMID: 17630266 [PubMed - indexed for MEDLINE]

17. Low PA, Benrud-Larson LM, Sletten DM et al. Autonomic symptoms and diabetic neuropathy: a population-based study. *Diabetes Care.* 2004 Dec;**27**(12):2942-7.

PMID: 15562211 [PubMed - indexed for MEDLINE]

18. Chakrapani M, Shenoy D, Gafoor AK. Blood sugar profile in diabetics receiving plain insulin. *Indian J Med Sci.* 2001 May;**55**(5):263-5.

PMID: 11641918 [PubMed - indexed for MEDLINE]

19. Mayfield JA, Reiber GE, et al. Do foot examinations reduce the risk of diabetic amputation? *J. Fam Pract.* 2000; 49-499-504 [PubMed]

20. Anderson H., Michael D. et al. Atrophy of foot muscles. A measure of diabetic neuropathy. *Diabetic Care.* October 2004. 27,10 2382-2385.

21. Stephan F.E. Paet et al. Optimizing the therapeutic benefits of exercise in Type 2 Diabetes. *J. Appl Physiol* 103: 1113 – 1120, 2007

22. Slovik D.M. Approach to the Patient with Diabetes Mellitus. Primary Care Medicine. 5th edition. Pg 717 – 735. Publishers Lippincott, Williams and Wilkins.
23. Sone H, Katagiri A, et al JDC Study Group, JAPON. Effects of Lifestyle Modification on Patients with type 2 Diabetes: The Japan Diabetes Complication Study (JDCS) Study Design, Baseline analysis and three year – interim report.
24. Raymond OE, Barrett W. et al . Effect of BP control on Diabetic Microvascular complications in patients with hypertension and type 2 Diabetes . Diabetes Care. 23(Suppl 2): B54-B64, 2000
25. Savige J, Martin FIR. Mortality and Morbidity of Diabetes in Papua New Guinea. Diabetologia (1982), 23: 136-137.
26. Bradshaw D., Norman R et al. Estimating the burden of disease attributable to diabetes in South Africa. South African Medical Journal, August 2007.
27. Hanley A.J.G. , Stewart B. et al. Complications of type 2 Diabetes among Aboriginal Canadians. Prevalence and associated risk factors. American Diabetes Association. Journal of Diabetic Care, August 2005. Vol 28 no8 pg2054-2057.
28. EURODIAB.Study. Diabetes Care, vol 28, no9 Sep 2005
29. Diabetic neuropathy. American Diabetes Association. Diabetes Care.(2003) 26: 594-598
30. Valenesi P., Paries J. et al. Cardiac autonomic neuropathy in diabetic patients: influence of diabetic duration, obesity and microangiopathic complications – the French multicentre study. Metabolism 2003. Vol52, issue7, pgs 815-820,

MEDICAL RESEARCH ETHICS COMMITTEE
PE HOSPITAL COMPLEX

Chairperson: Dr B.G. Brown
Phone : 041 3923265
Fax : 0413923329
Email: basil.brown@impilo.ecprov.gov.za

29 August 2008

Dr E.E. Ajudua
Dora Nginza Hospital

Dear Dr Ajudua

**RE: STUDY TO EXAMINE THE PROFILE OF DIABETIC COMPLICATIONS IN ADULT PATIENTS
AT DORA NGINZA HOSPITAL**

The committee hereby gives its approval for you to conduct the study as set out in your research proposal, at Dora Nginza Hospital.

We wish you all the best for the successful conduct of this study.

Yours sincerely



.....
Dr B.G. Brown



UNIVERSITEIT • STELLENBOSCH • UNIVERSITY
jou kennisvenoot • your knowledge partner

9 September 2008

Dr EE Ajudua
Dept of Family Medicine and Primary Care

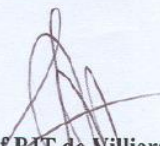
Dear Dr Ajudua

RESEARCH PROJECT : "What is the profile of complications among adult diabetic patients
in Dora Nginza Hospital, Port Elizabeth?"
PROJECT NUMBER : N08/07/195

My letter dated 28 July 2008 refers.

At a meeting that was held on 3 September 2008, the Committee for Human Research ratified the approval of the above project by the Chairperson.

Kind regards


pp
Prof P.J.T. de Villiers
Chairperson: Committee for Human Research
RESEARCH DEVELOPMENT AND SUPPORT (TYGERBERG)
Tel: +27 21 938 9207/ E-mail: mertrude@sun.ac.za

R:\CHRM\N2008\W0807195_AJUDUA\N0807195_AJUDUA_RATIFIEDPROJECT.DOC

Fakulteit Gesondheidswetenskappe • Faculty of Health Sciences

Verbind tot Optimale Gesondheid • Committed to Optimal Health
Afdeling Navorsingsontwikkeling en -steun • Research Development and Support Division
Posbus/PO Box 19063 • Tygerberg 7505 • Suid-Afrika/South Africa
Tel: +27 21 938 9677 • Faks/Fax: +27 21 931 3352
E-pos/E-mail: rdsinfo@sun.ac.za